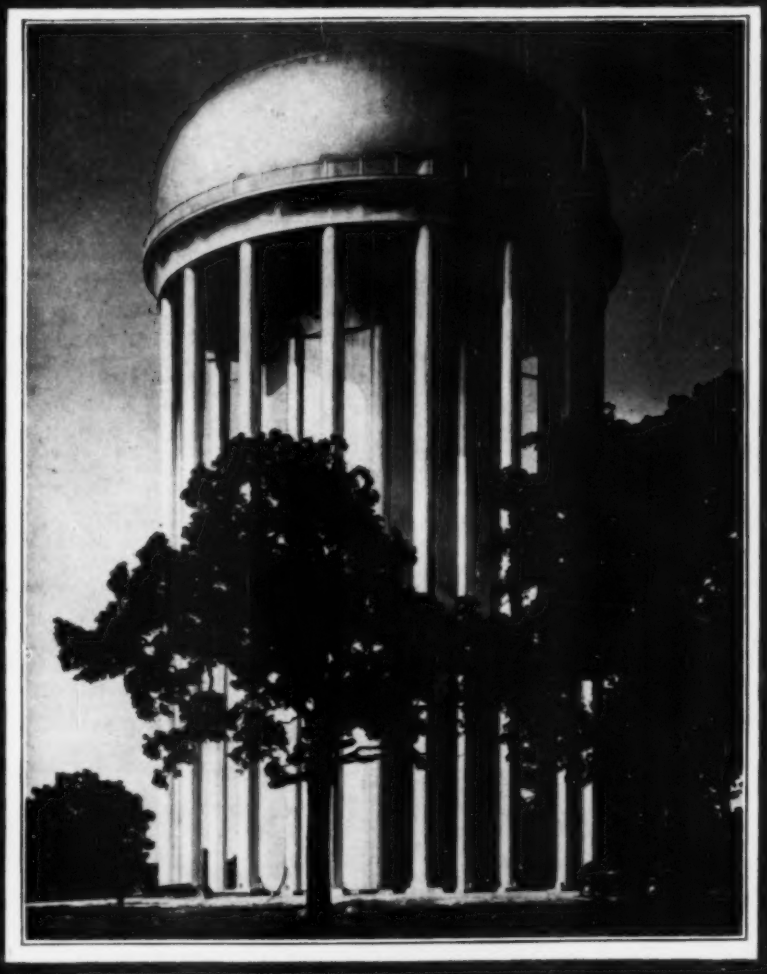
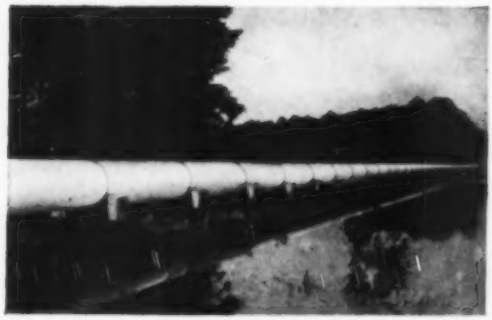
WATER & SEWAGE WORKS

WATER SUPPLY • INDUSTRIAL WASTE TREATMENT • SEWAGE DISPOSAL

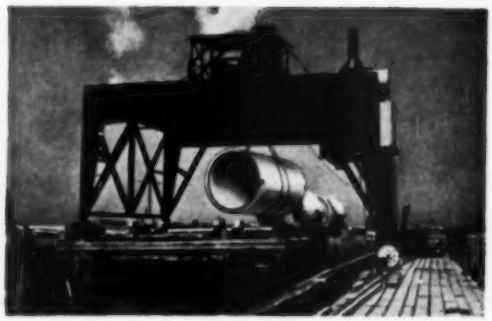


Greensboro's Newest Tank

JANUARY, 1932



Lee Hall Reservoir crossing, part of the 237,400' of 24", 27", 34" and 39" Lock Joint Reinforced Concrete Cylinder Pipe supplying water to the Newport News shipyards.



Loading a section of 120" Lock Joint Reinforced Concrete Subaqueous Pipe for 18,500' Nottingham Intake, supplying water for the City of Cleveland.

Build for the future... with
LOCK JOINT CONCRETE PRESSURE PIPE

Tulsa's new water supply line includes approximately 280,000' of 84", 72" and 66" Lock Joint Reinforced Concrete Pressure Pipe.

Lock Joint plant where 233,000' of 69" and 66" Prestressed Concrete Cylinder Pipe were manufactured for the Rio de Janeiro water supply line.

The building of a water supply line represents a large and extremely important investment. For this reason every effort is made to select the most dependable and permanent type of pressure pipe for the project. Investigation to determine the most reliable pipe available will show that Lock Joint Concrete Pressure Pipe has proven its superiority by years and years of unparallelled performance.

The permanence of Lock Joint Pipe eliminates any necessity for replacement of the line. The conservative design of its steel reinforcement avoids the dangers of blow-out or rupture while providing an ample safety factor for unusual internal pressures and heavy backloads. Dense concrete walls prohibit tuberculation or corrosion and assure extreme durability and life-long high carrying capacity.

In short, Lock Joint Concrete Pressure Pipe provides permanence, efficiency and safety for one of the most vital and essential public utilities. For your next water supply project involving pipe 16" in diameter or larger, specify Lock Joint—the pressure pipe whose future has been proven by its past.

LOCK JOINT PIPE COMPANY

Est. 1905

P. O. Box 269, East Orange, N. J.

Pressure Pipe Plants: Wharton, N. J., Turner, Kan., Detroit, Mich., Columbia, S. C.

BRANCH OFFICES: Cheyenne, Wyo. Casper, Wyo. • Denver, Col. • Kansas City, Mo. Walker Park, Md. • Wichita, Kan. • Chicago, Ill. Rock Island, Ill. • Kenilworth, N. J. • Hartford, Conn. • Tucumcari, N. Mex. • Tulsa, Okla. Oklahoma City, Okla. • Beloit, Wis. • Rato Rey, P. R.

SCOPE OF SERVICES—Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipes of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous Lines.

A TWO WAY HIT!*

ROCKWELL 8-INCH MANIFOLD COMPOUND METER UNIT

*This dual unit is . . .

1. *Easier to install and service*
2. *Assures accurate measurement and long life—at low cost*

This dual assembly of Pittsburgh-Empire compound meters is easier to handle—the complete unit of meters, valves and piping weighs approximately 100 lb less than a single 8-inch meter. It can be broken down in sections for easy two-man installation. Too, maintenance is simplified since one side of this dual unit can be shut down without service interruption while a new meter or a shop calibrated repaired meter is being installed.

The initial cost for most installations is less! Write for full details.

You Can RELY ON ROCKWELL

For Everything in Measurement and Control

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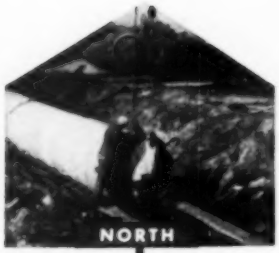

TYLOX *flexible rubber* JOINTS
STOP INFILTRATION

North, East, South, and West — TYLOX flexible rubber gaskets are consistently making sewers and industrial wastes lines "leakproof for life." Engineers and contractors, everywhere, are continually finding these long-lasting, easily-installed joints the only real answer to tough infiltration problems.

Snapped on the pipe like giant rubber-bands, TYLOX gaskets meet the toughest "specs," the closest dead-lines, the tightest budgets — and, in the wettest ditches. "Bottle-tight" lines — even below normal water levels — are a common, rather than unusual, achievement.

Remember, TYLOX joints mean permanently tight lines, assure rated capacities, and eliminate the treatment of infiltrated water at the disposal plant. Remember, also, TYLOX joints permit fast coupling, quicker back-filling, and lower "perlaid foot" costs.

On that next job, be certain of a tight line with the right coupling — with TYLOX RUBBER JOINTS.

Write, wire, or phone for Technical Data and Literature on TYLOX Gaskets.

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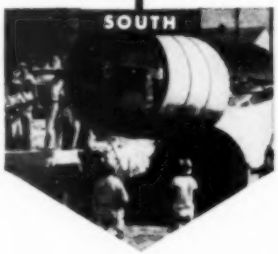
MANUFACTURING CO.
KENT, OHIO
218 Gougler Avenue **Tel. 3449**

Making Joints with
TYLOX RUBBER GASKETS
Is as simple as A B C

Cement tongue and snap on Tylox gasket.

Lubricate sliding surfaces with Tylox Cement.

Shove the pipe home.



"THE ONLY PERMANENTLY TIGHT LINES ARE LAID WITH RUBBER JOINTS"

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WATER & SEWAGE WORKS

WATER SUPPLY • SEWAGE DISPOSAL
INDUSTRIAL WASTE TREATMENT

COMING ARTICLES

"Sewage Treatment and Industrial Wastes—1950" by Earnest Boyce, president of the Federation of Sewage & Ind. Wastes Assns., is the February annual review of developments and trends. . . "Water Supplies and Sewage Treatment in the Scandinavian Countries" will be covered in a series of short articles by E. L. Knoedler, representing Sheppard Powell. . . "Treatment of Sauerkraut and Pickle Wastes" is a report of pilot plant studies by T. R. Haseltine. . . "Operation of Small Water Works" is further discussed by A. E. Clark, whose next article covers the important matter of "Income and Outgo." . . "Sewage and Industrial Treatment Practices in Great Britain" is being recounted in a series of short articles by John Finch of Rotherham, Eng. . . "Method of Estimating Sewage Treatment Plant Costs" is the contribution of J. C. Frederick. . . The problem of "Detergents in Sewage" is discussed by C. E. Keefer.

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VOL. 99 — **January, 1952** — NO. 1

Water Supply . . . . 1951 — 1
By Albert E. Berry, *Toronto, Ontario*

Pipe Cutting Experiences With the Improved Wachs Pipe Saw — 14
By Don W. Anglin, *Chicago, Ill.*

A New Coagulation Aid — 16
By F. M. Kemmer and C. B. Houser, *Philadelphia, Pa.* and R. E. Steeper and B. W. Dickerson, *Wilmington, Del.*

Basic Factors in Centrifugal Pump Application (Part VI) — 20
By Roy Carter and Igor J. Karassik, *Harrison, N. J.*

New Water Works for Pax, W. Va. — 24
By Dennis M. Leary, *Beckley, W. Va.*

Mono—and Dichloramine Determination in Water — 25
By A. T. Palin, *Newcastle on Tyne, England*

Determining Length of Coils — 26
By W. F. Schaphorst, *Newark, N. J.*

St. Paul Host to Federation — 27
By Harry A. Faber and George E. Symons

Notes and Comments on Sewage Treatment Practices in Great Britain — 34
By John Finch, *Rotherham, England*

Mechanical Handling of Vacuum-Filter Sludge Cake — 36
By C. E. Keefer, *Baltimore, Md.*

C. E. Keefer Becomes Editorial Associate — 37

Rapid Photometric Estimation of Process Efficiency — 38
By W. Wesley Eckenfelder, *Ridgewood, N. J.*

Meetings Scheduled — 78A

"Here and There" with Doc Symons — 82A

Manufacturers' and Equipment News — 91A

Literature and Catalog — 104A

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modernize—for greater capacity—**economically** with Rex Floctrol and Verti-Flo!

When increased demands exceed the capacity of your water treatment plant, you can bring your plant up-to-date . . . step up capacity . . . economically with **Rex Floctrols** and **Verti-Flo** Clarifiers. Installed in new or existing tanks, these efficient units provide greatly increased capacities . . . more effective results.

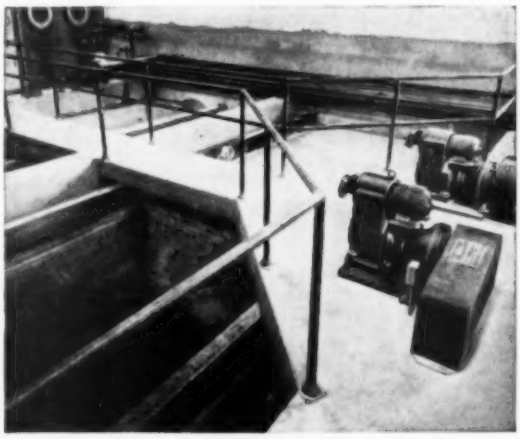
At the Fairmont, Minn., treatment plant for example, **Rex Floctrols,** installed in modernized tanks, and a **Verti-Flo** in an existing tank, made possible an increase in plant capacity from the originally designed capacity of 500,000 G.P.D. to 2,000,000 G.P.D. *without increasing the physical size of the plant.*

Tests show that the chemical reaction is complete within the Floctrol despite the extreme seasonal changes in water temperature.

The **Verti-Flo** equipment was installed in two existing rectangular settling tanks, providing for and efficiently handling 2,000,000 gallons daily, an increase of 1,500,000 gallons daily over the original designed capacity of the two conventional tanks. Detention time was reduced from 6.2 hours to 1½ hours, and solid removals were remarkably improved. Effluents were improved to the point where filter runs were increased 5 to 6 times.

Why not reap the benefits of this modernization for your plant? For complete details and informative literature, write: **Chain Belt Company,** 1610 W. Bruce Street, Milwaukee 4, Wisconsin.

Rex Verti-Flo Clarifier at Fairmont, Minn.



Rex Floctrols at Fairmont, Minn.

CHAIN BELT REX COMPANY

WATER TREATMENT EQUIPMENT

THIS "Life Line" FORETELLS GOOD FORTUNE FOR YOUR PIPING

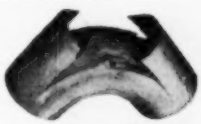
Every cost sheet today confirms the fact that the most expensive material you can use is that which must be replaced too soon . . . and too often. Premature pipe failure digs deep into your profit pocketbook—directly, through repair or replacements; indirectly, through production tie-ups and disrupted routine.

Users by the thousands have found the answer to lower maintenance in Byers Wrought Iron pipe. They have come to recognize its *red spiral stripe* as a dependable "life line" for predicting future service. They know that when corrosion is a threat to durability, Byers Wrought Iron pipe lives up to the prediction and pays-off in long, trouble-free service.

This time-tested material has rolled up impressive service records in a wide variety of applications. It is serving in thousands of snow-melting systems, of all sizes. Its mechanical strength and proved corrosion resistance make it the first choice for radiant heating systems. In steam and return lines, Byers Wrought Iron pipe has been remarkably effective in eliminating excessive repairs. It has successfully combated corrosive hazards in condenser services, air conditioning systems, underground lines, and sewage disposal plants. Many more services could be added to this list . . . but these will serve to suggest genuine wrought iron's many possibilities.

The next time you approve or specify pipe, investigate the superior performance of genuine wrought iron. You'll find it profitable to do so. For more facts on this time-tested material, write for our bulletin, THE ABC's OF WROUGHT IRON.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.



WHY GENUINE WROUGHT IRON LASTS

This notch-fracture test specimen illustrates the unique fibrous structure of genuine wrought iron—which is responsible for the high corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

THE LONG AUGUST NIGHT WAS HOT—but not as hot as the bitter fighting that raged about Agok, Korea, in the Naktong River area. Sergeant Kouma, serving as tank commander, was covering the withdrawal of infantry units from the front. Discovering that his tank was the only obstacle in the path of an enemy breakthrough, Sergeant Kouma waged a furious

nine-hour battle, running an eight-mile gantlet through enemy lines. He finally withdrew to friendly lines, but not until after his ammunition was exhausted and he had left 250 enemy dead behind him. Even then, although wounded twice, he attempted to re-supply his tank and return to the fighting.

"A withdrawing action is not my idea of how Americans should fight," says Ernest Kouma. "If we must fight, let's be strong enough to take the offensive. In fact, *if we're strong enough*, we may not have to fight at all. Because, nowadays, *peace is for the strong*.

"So let's build our strength—to keep a strong America at peace. You can help by buying Defense Bonds—as many as you can afford. It's far less painful to build for peace than to destroy in war. And *peace* is what you're building when you buy Bonds."

M/Sgt. Ernest R. Kouma

Medal of Honor

Remember that when you're buying bonds for national defense, you're also building a personal reserve of cash savings. Remember, too, that if you don't save regularly, you generally don't save at all. So sign up today in the Payroll Savings Plan where you work, or the Bond-A-Month Plan where you bank. For your country's security, and your own, buy United States Defense Bonds now!

Peace is for the strong... Buy U.S. Defense Bonds now!

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Water and Sewage Works

It may cost pennies more in the can . . .
But it costs dollars less on the tank

THERE's only one sensible way to measure cost when you buy paint to protect a 10,000 gallon tank from corrosive attack, and that's *cost per year per square foot of protection.* A 10% saving in cost per gallon in the can doesn't mean a thing if the paint fails on the tank. More coverage per gallon is just another headache if the paint film on the tank is "protection thin."

When you ask a paint film a few thousandths of an inch in thickness to protect equipment costing thousands of dollars, it just doesn't pay to buy anything less than the best, no matter how many pennies you save in cost per gallon.

That's why you'll find chemical plants with low cost maintenance records use Tygon Paint almost exclusively: to protect concrete or steel tanks, structural steel work, walls, ceilings, and machinery and equipment exposed to corrosive fumes. They know the few cents more per gallon means dollars less per year.

This booklet points the way to lower maintenance costs. Tells you where, when, and how to use Tygon Paint. It's yours for the asking. No cost. No obligation. Write for Bulletin 712, Plastics & Synthetics Division, Dept. W.S.W., The U. S. Stoneware Co., Akron 9, Ohio.

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PLASTICS & SYNTHETICS DIVISION

THE MEMBERSHIP OF A C.I.P. Century Club now has

96%

OF ALL 6-INCH AND LARGER CAST IRON WATER MAINS EVER LAID IN 25 REPRESENTATIVE CITIES ARE STILL IN SERVICE.

Based on the findings of a survey conducted by leading water works engineers.

CAST IRON

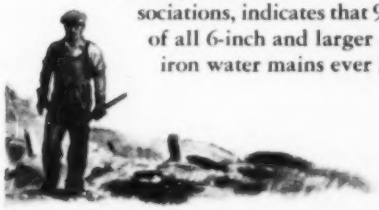
CAST IRON PIPE

DISTINGUISHED CLUB...
38 Members*

The Cast Iron Pipe Century Club is probably the most unusual club in the world. Membership is limited to municipal, or privately-owned, water and gas supply systems having cast iron mains in service for a century or more.

Although the Club is formally constituted, there are no dues, no regular meetings, and no obligations other than to inform the Recording Secretary if and when the qualifying water or gas main is taken out of service, or, sold for re-use.

In spite of the unique requirement for membership, the Club roster grows, year by year. And why not, when a survey sponsored by three water works associations, indicates that 96% of all 6-inch and larger cast iron water mains ever laid



in 25 representative cities are still in service. And when answers to a questionnaire, mailed to gas officials in 43 large cities, show that *original* cast iron mains are still in service in 29 of the cities.

If your records show a cast iron main in service, laid a century or more ago, the Club invites you to send for a handsome framed Certificate of Honorary Membership. Address Thomas F. Wolfe, Recording Secretary, Cast Iron Pipe Century Club, Peoples Gas Bldg., Chicago 3, Illinois.

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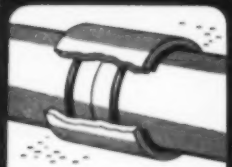
*8 new members in 1951

SERVES FOR CENTURIES

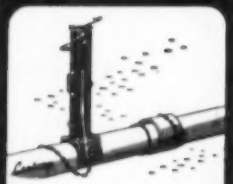
When new water main estimates exceed borrowing capacity

investigate "CENTURY"® asbestos-cement pressure pipe

Light-weight, easy-to-handle "Century" Pipe can be stored wherever convenient; moved without special handling equipment.



Cut-away view of the "Century" Simplex Coupling. Simplex Couplings make immediately and permanently tight joints.



With this simple tool, even an unskilled laborer can quickly make a tight joint for straight runs or curves up to 5° deflection per pipe length using "Century" Simplex Couplings.

Now many communities can have modern water main systems—or extend existing systems—at costs that can be more easily amortized out of revenues. Residents can enjoy the convenience of centrally supplied water in their homes, plus the advantages of increased fire protection and often, lower fire insurance rates. Community planners find it easier to raise needed funds because of the relatively low-cost features of "Century" Asbestos-Cement Pipe.

"Century" Pipe is moderate in price. And, though it is exceptionally strong, it is also light in weight and easy to handle: installation is quick, easy, and at low cost.

Add to these the durability of "Century" Pipe, its absolute freedom from tuberculation, its high resistance to soil corrosion and immunity to electrolysis, and you'll quickly see why: *Before you buy or specify any pipe for water mains, it will pay you to investigate "Century" Asbestos-Cement Pressure Pipe.*

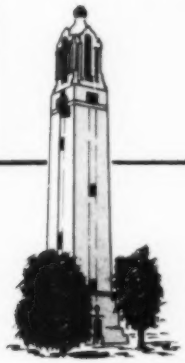
FREE booklet, "Mains Without Maintenance," sent on request. Write for it.

Nature made Asbestos... Keasbey & Mattison has made it serve mankind since 1873

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

MODERN WATER STORAGE

is basic in Brookings, South Dakota



Brookings, South Dakota, is another growing city that has turned to Horton elevated storage for better municipal water service.

As many cities have discovered, elevated storage results in these important advantages to municipal water systems . . . increased water pressure . . . decreased pressure variations . . . and reduced pumping costs. Combine these features with more modern appearance and easier, less costly maintenance, and it is understandable why so many Horton elevated water tanks are in service throughout the country.

Horton elevated tanks with ellipsoidal-bottoms are built in standard capacities from 15,000 to 500,000 gallons. Elevated tanks with radial-cone bottoms are built in standard capacities from 500,000 to 3,000,000 gallons. Horton reservoirs and standpipes are built in capacities up to 10,000,000 gallons. If you are interested in bettering your water system—consider Horton storage. Write our nearest office for further information. There is no obligation on your part.

Shown above is a reproduction of the Coughlin Campanile, located on the campus of the South Dakota State College of Agriculture and Mechanical Arts, in Brookings. Shown at the right is the 250,000-gal. Horton elevated water tank that serves the city.

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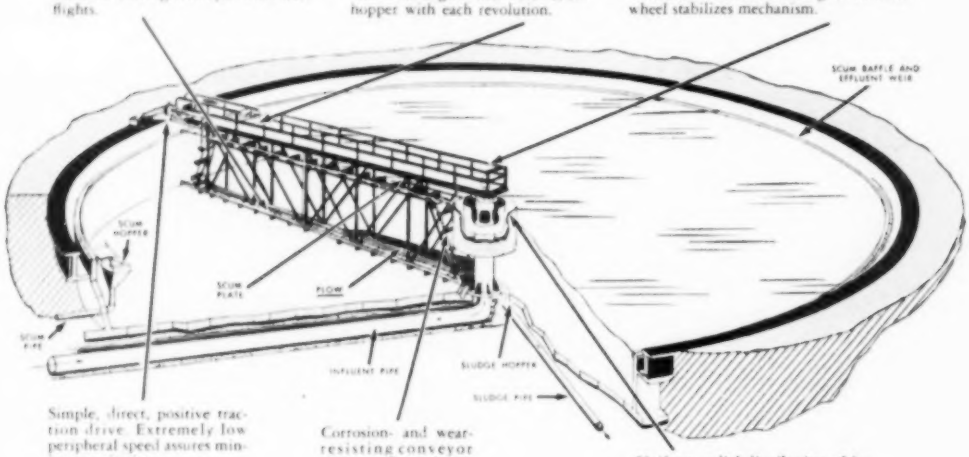
Los Angeles 17 — 1555 General Petroleum Building
New York 6 — 3390—165 Broadway Building
Philadelphia 3 — 1644—1700 Walnut Street Building
San Francisco 4 — 1583—200 Bush Street
Seattle 1 — 1350 Henry Building
Tulsa 3 — 1646 Hunt Building
Washington 6, D.C. — 1109 Cafritz Building

Plants in Birmingham, Chicago, Salt Lake City, and Greenville, Pa.
In Canada—Horton Steel Works, Limited, Fort Erie, Ont.

Settled sludge is collected by a plow with a brass squeegee and carried continuously to the drawoff hopper by the slow-moving conveyor with steel flights.

Floating material is carried to a trap at the outer end of the bridge by the return run of the conveyor and discharged into the scum hopper with each revolution.

Rugged bridge pivots on a large ball bearing. Outer end is mounted on a solid rubber tired traction drive wheel equipped with anti-friction bearings. Forward wheel stabilizes mechanism.



Simple, direct, positive traction drive. Extremely low peripheral speed assures minimum agitation.

Corrosion- and wear-resisting conveyor chains are Promal with a tensile strength of 70,000 lbs./sq. in.

Uniform radial distribution of influent is provided by solid and perforated baffles that dissipate the kinetic energy.

Removes all sludge from tank floor in one revolution

LINK-BELT Circuline Sludge Collector offers efficiency of Straightline Action for round settling tanks

GET quick, positive sludge and scum removal from round settling tanks with Link-Belt Circuline Sludge Collectors. Famous Straightline action provides high efficiency and greater solids concentration.

That's because maximum sludge concentration and complete sludge and scum removal are accomplished—in the shortest time—without septicity . . . without maintaining any sludge blanket.

Circuline Collectors are part of the complete Link-Belt line of quality equipment. Our sanitary engineers will be glad to work with your engineers, chemists and consultants to give you the best in modern water, sewage or industrial liquids treatment equipment.

In water, sewage and industrial liquids plants, intermittent operation (usually once or twice per day) assures high efficiency and real economy. In final tanks of activated sludge plants operation is continuous.

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,555

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

SIMPLICITY of AMERICAN METERS

MEANS EASIEST ASSEMBLY

American Meters always assemble right-side up. Works can always be fully inspected after assembly before putting the top casing in place. No locating pins are needed and any way the meter goes together is a right way.

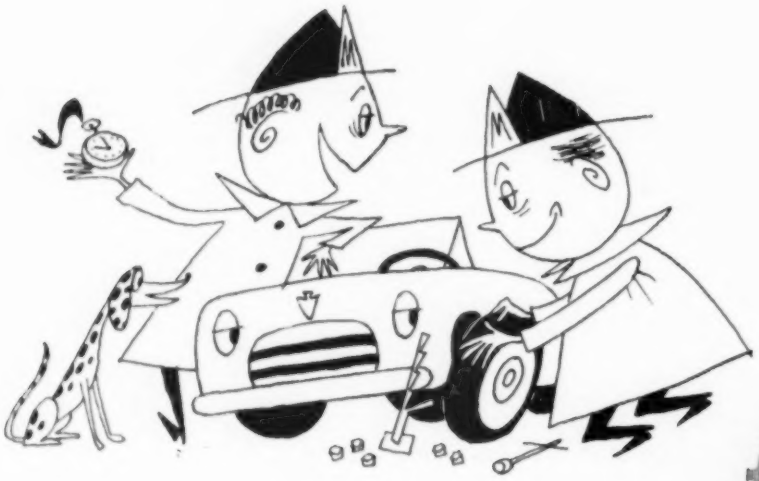
Quick dismantling and re-assembly is possible when repairs are necessary because American Meter parts are fully interchangeable yet have extreme simplicity of construction. These features give you more earning time for each meter, reduce shop time for servicing.

Write today for full information.

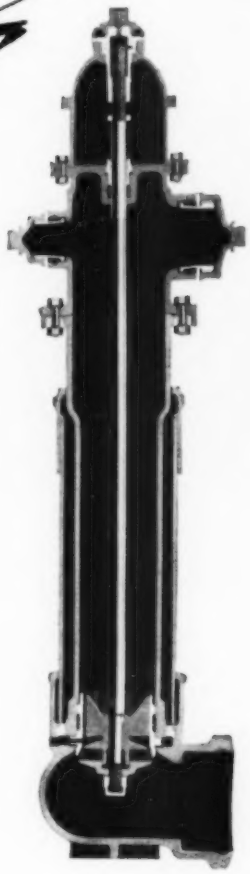
BUFFALO METER CO.

2909 MAIN STREET, BUFFALO 14, NEW YORK

Quick as changing a wheel



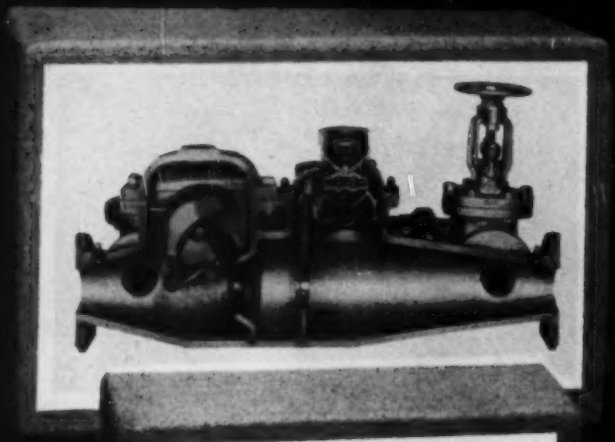
When a Mathews Hydrant is broken in a traffic accident, two men can put in a new barrel in a matter of minutes—*without excavating*. Speed of replacement is important when community safety is at stake.

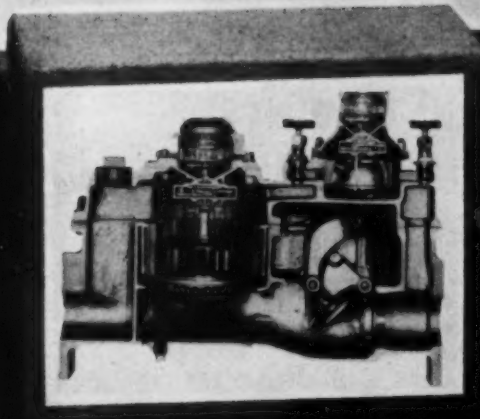


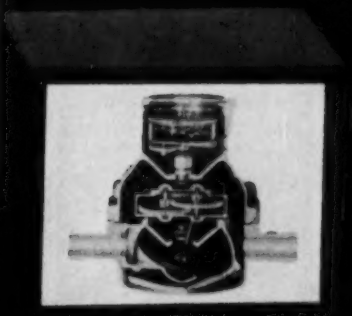
MATHEWS HYDRANTS

Made by R. D. Wood Company Public Ledger Building, Independence Square, Philadelphia 5, Pa. • Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

Mathews Modernized Hydrants . . . Tops in Convenience and Dependability Compression-type valve prevents flooding • Head turns 360° • Replaceable head • Nozzle sections easily changed • Nozzle sections raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • Operating thread only part to be lubricated • All working parts contained in barrel • A modern barrel makes an old Mathews good as new • Available with mechanical joint pipe connections







The Three Cornerstones of the Water Works Field

HERSEY DETECTOR METER

HERSEY COMPOUND METER

HERSEY DISC METER

HERSEY MANUFACTURING COMPANY

SOUTH BOSTON, MASS.

BRANCH OFFICES: NEW YORK — PORTLAND, ORE. — PHILADELPHIA — ATLANTA — DALLAS — CHICAGO
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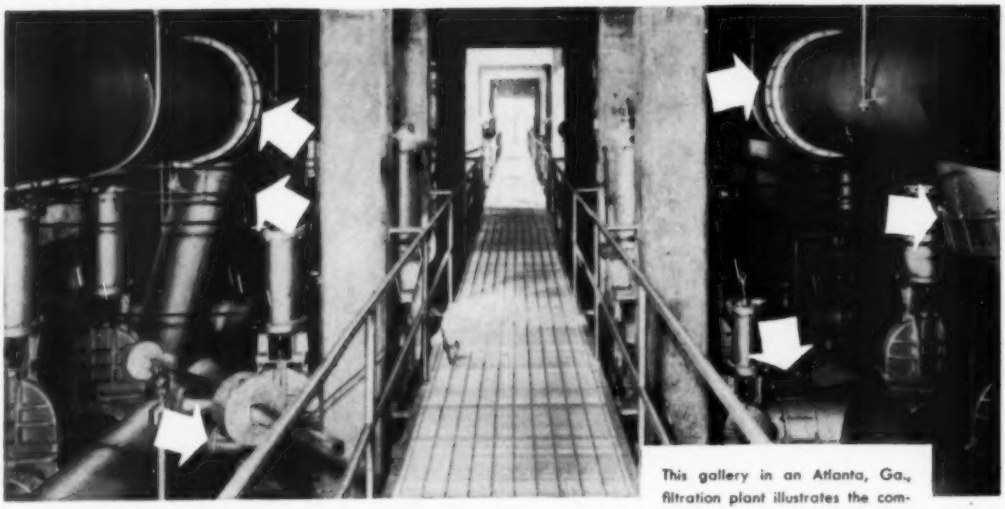


This gallery in an Atlanta, Ga., filtration plant illustrates the complicated type of pipe layout that is so much more easily installed with Dresser Couplings than by other methods. This particular installation has been called *the most economical of its type ever built.*

"FLEXIBLE-TIGHT" JOINTS SIMPLIFY CONSTRUCTION

Around water, sewage and industrial waste installations, there is frequently a problem of precise fitting of very large, heavy pipe. Sanitary engineers have found that the *easiest* way to join this pipe is also the *most dependable.*

Any workman can install Dresser Couplings. No special skill is required. Installation moves right along and the need for close pipe fitting is eliminated.

Even when pipe ends don't meet, or pipe is slightly offset, Dressers permit safe, secure joining. The stress is taken up by specially compounded rubber gaskets that provide flexible, high-pressure packing around both pipe ends.

And all parts are factory built and tested . . . ready to install when you get them.

Dressers provide give-and-take, harmlessly absorb pipe movements from expansion and contraction, vibration and settling. And your joints stay tight for the life of your installation.

See your nearest Dresser Sales Engineer, or write today for more information about Dresser applications on water, sewage and industrial waste projects.

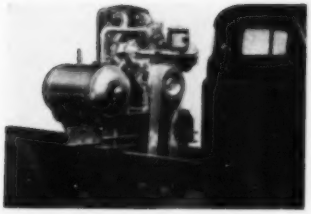
The complete dependability of Dresser Couplings is illustrated on this Dresser-Coupled sewage line in Wayne County, Michigan. Line runs under Rouge Parkway Lake that has been drained during construction. Despite soft pipe foundation, line had to be absolutely tight to prevent sewage contamination of the lake. And Dressers did the job.

DRESSER

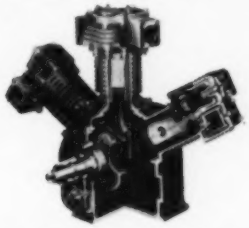
"FLEXIBLE-TIGHT"

COUPLINGS

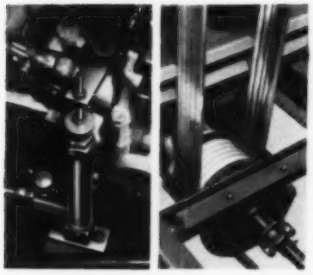
Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Bayshore Highway, South San Francisco, California. Sales Offices: New York, Philadelphia, Chicago, Houston, South San Francisco. In Canada: 629 Adelaide St., W., Toronto, Ont.



More Capacity: 125 cfm at 100 psi. Runs 2 heavy pavement breakers at full efficiency, with truck engine at only 1750 rpm.



Smooth Operation: No vibration under full load with this perfectly balanced 2-stage W-type compressor unit.



Simplest Automatic Control: Regulates engine speed to air demands without complicated linkage. Positive in action.

Cemco Power Take-Off: No gears. Only 4 moving parts. Clutch controlled from cab.

Utilities that never before used truck-powered compressors are installing the JAEGER TRAVEL-AIR

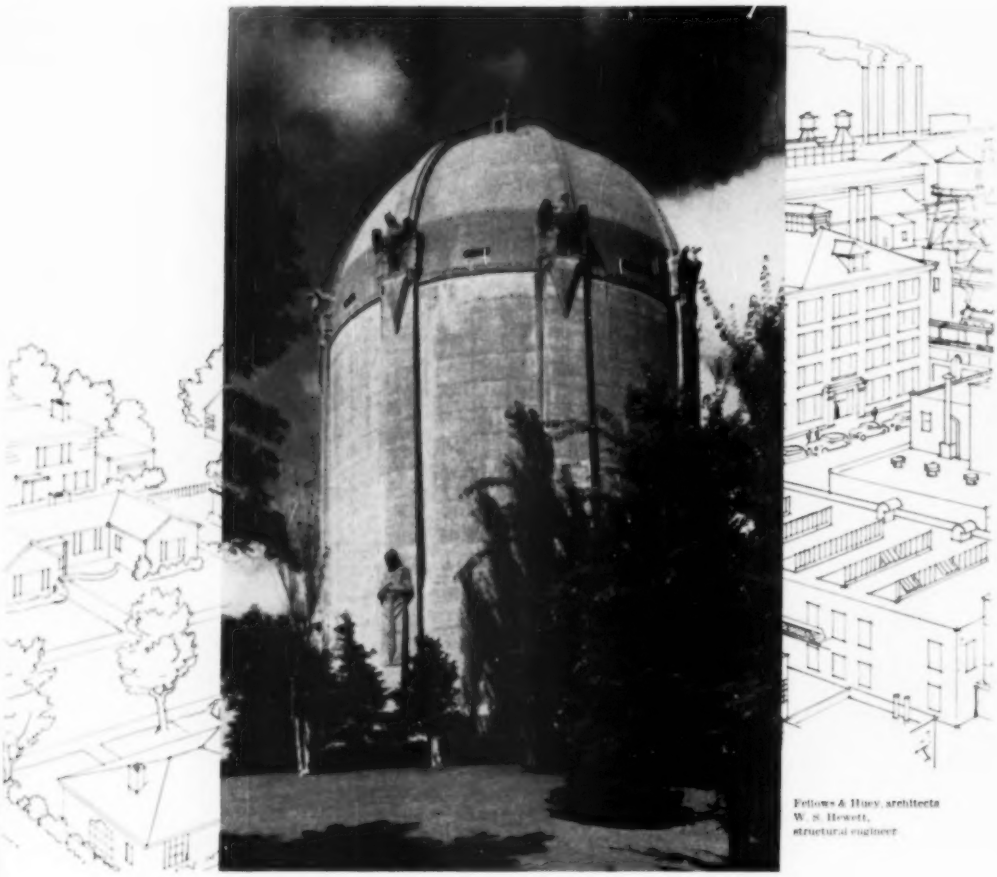
More air, no vibration, simple automatic control of engine speed—plus the advantages of power take-off

By taking power from your truck engine, which otherwise stands idle 7 hours out of 8, you save $950 to $1,000 in cost, 50% of the maintenance and all the extra weight and bulk of a separate engine and trailer mounting. Also saves waiting for engine to warm up at every job.

By using the air-cooled Jaeger 125 cfm compressor unit (largest selling compressor in the construction field) you get 20 cfm more air to run your tools at full efficiency.

Easy to mount on 1½ and 2 ton Chevrolet, Dodge, Ford, GMC or International trucks of long wheelbase current model. Get our Catalog TC-1, giving full information.

THE JAEGER MACHINE CO.,
680 Dublin Avenue, Columbus 16, Ohio
PUMPS • MIXERS • PAVING MACHINERY
SALES AND SERVICE IN 153 CITIES OF U.S. AND CANADA



Fellows & Huey, architects
W. S. Hewett,
structural engineer

FOR WATER TANKS OF DISTINCTION
CHOOSE *CONCRETE*

A WELL DESIGNED concrete water tank such as this 1,500,000 gal. water tank in Washburne Park, Minneapolis, not only is a distinctive landmark but has long-lasting utility as well. Built in 1932, it has required no maintenance.

Any city, large or small, can obtain lasting benefits by building such a reinforced concrete water tank. Its sturdy construction gives it the durability to withstand the weathering action of any climate. Its enduring beauty makes it a structure of which the entire community always can be proud.

A reinforced concrete water tank can be erected in practically any location without marring the skyline or depreciating the appearance or value of the property in the area.

Best of all, reinforced concrete water tanks are more economical than other types. They require little or no maintenance. They retain their distinctive appearance over their long life. And they render ***low-annual-cost*** service—the true measure of construction value. Such service pleases taxpayers, engineers and municipal officials alike.

PORTLAND CEMENT ASSOCIATION

33 WEST GRAND AVENUE, CHICAGO 10, ILLINOIS

A national organization to improve and extend the uses of portland cement and concrete through scientific research and engineering field work

YOUR tap water can be palatable EVERY day

JOHN R. BAYLIS, world renowned water chemist, says that:

"Activated Carbon will remove every taste and odor producing pollution occurring in American surface water supplies if applied properly in sufficient dosages."

At Chicago's South District Filtration plant, they stay ahead of taste and odor trouble by making regular systematic threshold determinations and applying a sufficient amount of active carbon to keep their water palatable every day in the year. Mr. Baylis is satisfied only with true palatability, never with just "getting by."

To help keep your water palatable, our Threshold Odor Service Men are constantly available to assist you. Write, wire or phone our nearest office today.

NOTE: This advertisement is published with the idea of promoting production of uniformly palatable water, and the quotations from outstanding water works authorities should not be construed as being an endorsement for any particular product.

NUCHAR INSURES PALATABLE DRINKING WATER

industrial CHEMICAL SALES

division west virginia pulp and paper company

NEW YORK CENTRAL BLDG.
230 PARK AVENUE
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LINCOLN-LIBERTY BUILDING
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OTHER PRODUCTS: Snow Top Precipitated Calcium Carbonate—Nuchar Activated Carbon—Ligro Crude Tall Oil —Tallene Tall Oil Pitch—Indusoil Distilled Tall Oil—Tallex Abietic Acid—Polycel Cellulose Fibers—Indulin (Lignin)

WINSTON-SALEM, N. C.
Filtration Plant
(IMPROVEMENTS COMPLETED IN 1951)

ALBRIGHT & FRIEL, INC.
Consulting Engineers
PHILADELPHIA, PA.

J. D. SPINKS
Consulting Engineer
WINSTON-SALEM, N. C.

Omega Equipment furnished for the Winston-Salem Filtration Plant:

1–Loss-In-Weight Fluoridizer for feeding sodium silicofluoride.

1–Rotolock Feeder for carbon.

4–Loss-In-Weight Gravimetric Feeders with dust collectors, filling canopies, and mixing chambers, for feeding alum, ferric sulphate, and hydrated lime.

Recent changes in the Winston-Salem Filtration Plant fall into three main categories: (1) New construction to boost plant capacity from 12 MGD to 20 MGD. (2) Modernization of existing equipment in the original plant, first placed in service in 1925. (3) Establishment of a secondary source of raw water supply – the Yadkin River. These major improvements were brought to completion by the contractors V. B. Higgins Co., Greensboro, N. C., under the guidance of Stanford E. Harris, Supt. Water and Sewerage Division, and R. A. Thomas, Director of Public Works.

The redesigned plant now processes the water by flash mixing, flocculation, sedimentation, filtration, and chemical treatment. The feeding of primary alum, lime, and carbon; secondary lime and calgon; and sodium silicofluoride is handled by Omega Chemical Feeders, selected by the engineers for their high accuracy and long-range dependability. For Bulletins describing Omega Water Works Equipment, address Omega Machine Company (Division of Builders Iron Foundry), Providence 1, Rhode Island.

BIF INDUSTRIES

OMEGA
THE LAST WORD IN FEEDERS

Ω OMEGA

For the City of
DAYTON, OHIO

ANOTHER IMPORTANT STEP FORWARD IN LARGE-CAPACITY ELEVATED STEEL TANK DESIGN—

The *Toro-segmental Bottom* Tank *by* PITTSBURGH • DES MOINES

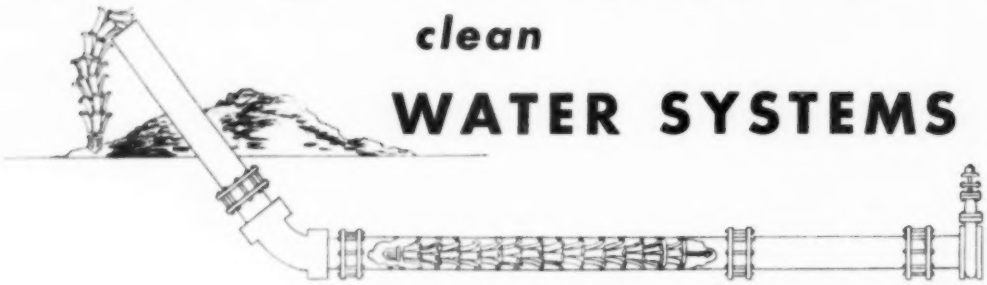
This Pittsburgh-Des Moines elevated steel tank, recently erected for the City of Dayton, is of new *Toro-segmental Bottom* design, with a water storage capacity of 2,000,000 gallons. The design carries the load by suspension of the tank bottom, rather than by beams—using less steel, and achieving lower cost. • The pleasing appearance of the tank is matched by its efficient performance: head range is but 34½ ft. The tank diameter is 102 ft.; high water line is 95 ft. above foundation tops. • Write for a consultation on your water storage requirements.

PITTSBURGH • DES MOINES STEEL CO.
Plants at PITTSBURGH, DES MOINES and SANTA CLARA

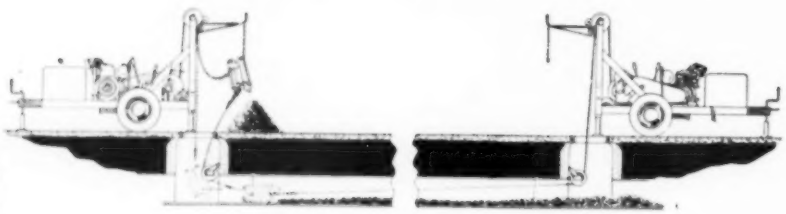
Sales Offices at:

PITTSBURGH (25) . . . . . 3418 Neville Island
NEWARK (2) . . . . . 218 Industrial Office Bldg.
CHICAGO (3), 1222 First National Bank Bldg.
DES MOINES (8), 919 Tuttle Street
DALLAS (1), 1223 Praetorian Bldg.
SEATTLE . . . . . 526 Lane Street
SANTA CLARA, CAL. . . . . 625 Alviso Road

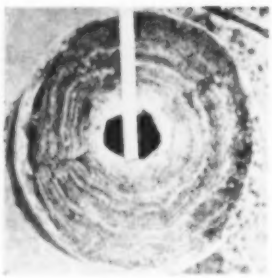
ACE Pipe Cleaning Contractors



clean WATER SYSTEMS and SEWER SYSTEMS



Anywhere
Any Time
Any Size
24 Hours a Day
7 Days a Week



Neglected city and industrial water pipes fill with debris like this—cut down service, increase fire rates. Let ACE clean them for you!

Fast, modern water pipe and sewer cleaning service—that's what ACE Pipe Cleaning Contractors, Inc., offers your city or industry *today*, wherever you are in the United States or Canada!

Preserve your system "for the duration," while pipe and steel are in short supply, with this thorough, economical service.

ACE brings the most modern equipment known to the job, plus trained, skilled crews to get the job done right, quickly and at *lowest possible* cost. ACE has representatives in several principal cities, ready to serve you. Write for further information. Let us send a man, at no expense or obligation to you. Get in touch with us today!

Cleaning jobs done thus far in 1951: Corps of Engineers, U. S. Army; City of Kansas City, Missouri; City of Kansas City, Kansas; Swift & Company; Armour & Company; Cudahy Packing Company; General Motors Corporation; Olathe, Kansas; Belton, Missouri; Milburn Country Club; Council Grove, Kansas; Procter & Gamble Mfg. Company.

✻ Ask to see our new 21 minute newsreel movie of the great Kansas City Flood of July, 1951. No cost or obligation.

ACE Pipe Cleaning Contractors, Inc.
CHestnut 2891
2003 Indiana Kansas City 1, Mo.

"Siamese Twin" Cities

of TEXARKANA, ARKANSAS... TEXARKANA, TEXAS have modern P.F.T. equipped plant

As inseparable and interdependent as Siamese Twins, Texarkana, Ark. and Texarkana, Tex.—though separate cities, each with its own municipal government—share a sewage treatment plant which was constructed jointly by the two cities.

This modern complete plant is of the high rate filter type and was designed to serve a population of 75,000.

Equipment includes the two 85-ft. diameter P. F. T. Digester Floating Covers shown above. The digesters have a total capacity of 254,000 cu. ft. P.F.T. Covers are designed and constructed for many years of efficient, dependable service, free of maintenance—provide effective digestion of sewage sludge and safe utilization of sludge gas.

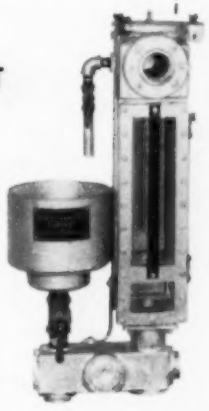
Both tanks are equipped with P.F.T. Supernatant Selectors piped to Supernatant Gauges, in the Control Building, affording effective means of observing the quality of supernatant liquor in the tank and controlling the rate of withdrawal.

Also included at Texarkana, in the Control Building, is a full complement of P.F.T. Gas Safety Equipment, completely eliminating the explosion hazard.

Wyatt C. Hedrick, Dallas, Texas, were Consulting Engineers on this project.

SUPERNATANT LIQUOR GAUGE

Withdrawal of supernatant is controlled at a low, constant rate by the use of this efficient, high visibility Gauge, Sight Glass and Sampler, used in conjunction with P. F. T. Supernatant Selector unit within the digester tank. Described in Bulletin No. 343.



P.F.T. PACIFIC FLUSH TANK CO.

Waste Treatment Equipment Exclusively Since 1893

4241 RAVENSWOOD AVE. CHICAGO 13, ILLINOIS

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

The right combination

FOR ANY WATER SUPPLY JOB

Layne offers you the right combination of unmatched experience plus modern equipment for installing well water supply units of any size—and for any purpose. Layne has made more water supply installations than any other firm in the entire world, and this valuable experience places Layne in a position to unquestionably do every job exactly right. Once the installations have been made, a complete record of everything is kept; strata formation, sand porosity, casing details, sand screen length, diameter and metal used, all pump information including bearings, shafting, impellers and operating characteristics. With such information, Layne is always in a position to give quick and most economical service for adjustments or repairs if and when needed.

Layne made the above well and pump installation to secure a constant and economical supply of cooling water for a large gasoline refinery.

When completed the above pictured well flowed more than 2 feet above the casing. With the installation of a Layne pump, the production was 1200 G.P.M.

Everything by Layne

Layne accepts your contract for furnishing everything; Layne supervision, Layne drill crews, Layne drill equipment, Layne designed and Layne built louver type sand screen and Layne high efficiency vertical turbine pumps. No other firm is involved, therefore there is no divided responsibility. This plan gives you the very finest well water supply units that world wide experience and skill can possibly build.

LAYNE & BOWLER, INC.

General Offices, Memphis 8, Tenn.

LAYNE CATALOGS

Layne offers a wide range of fully illustrated catalogs covering every phase of well water installations, pumps, well cementing and sand screens. Your request for any will be answered promptly.

Layne
WATER SUPPLY
WELLS & PUMPS

Dynamic Separation saves Money

INFILCO
* BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1934

OFFERED ONLY BY THE

Accelator®

IN ECONOMICAL WATER TREATMENT, an Accelator occupies but a fraction of the space of an "old-style" treatment plant because it is a single unit . . . because it eliminates the previous multiple steps of mixing, sedimentation and coagulation. The unique dynamic separation principle of operation

(continue to next page)

(from preceding page)

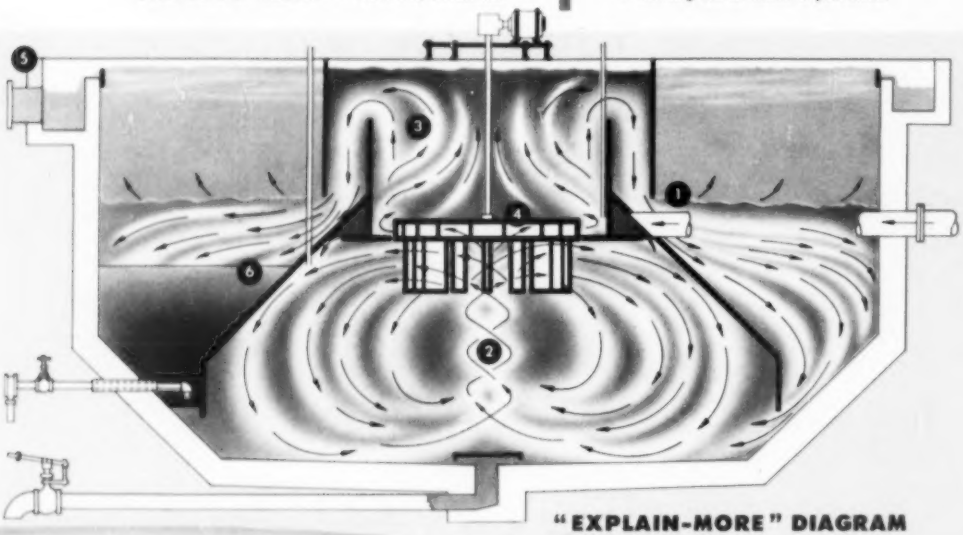
INFILCO
* BETTER WATER CONDITIONING * AND WASTE TREATMENT SINCE 1934

permits the treated water to separate from the top of a downward-moving pool of uniformly sized slurry in contrast to having the treated water filter upward through a suspension of sludge of gradually decreasing particle sizes.

INFILCO INC. ★ *Tucson, Arizona*

Outstanding advantages—based on more than two thousand Accelator efficiency-of-operation reports:

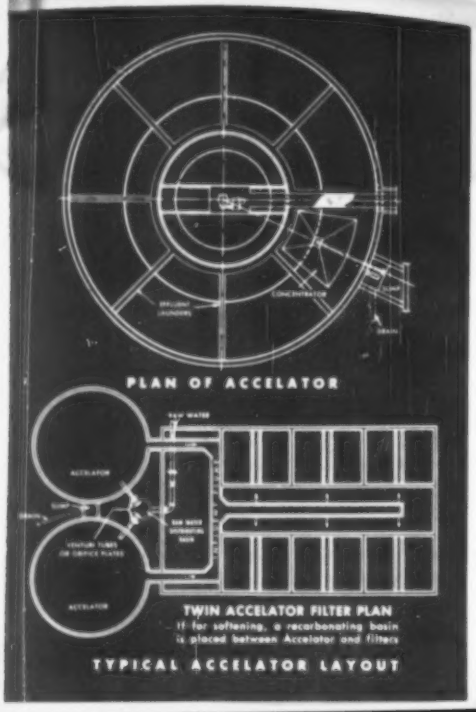
- Faster separation of solids from treated water
- Low-velocity movement of tremendous quantities prevents floc break-up
- Rapid mixing of incoming water and chemically impregnated slurry
- Small or large flows have complete contact with slurry
- Thickened sludge is automatically drawn off
- Settling-out of solids is prevented



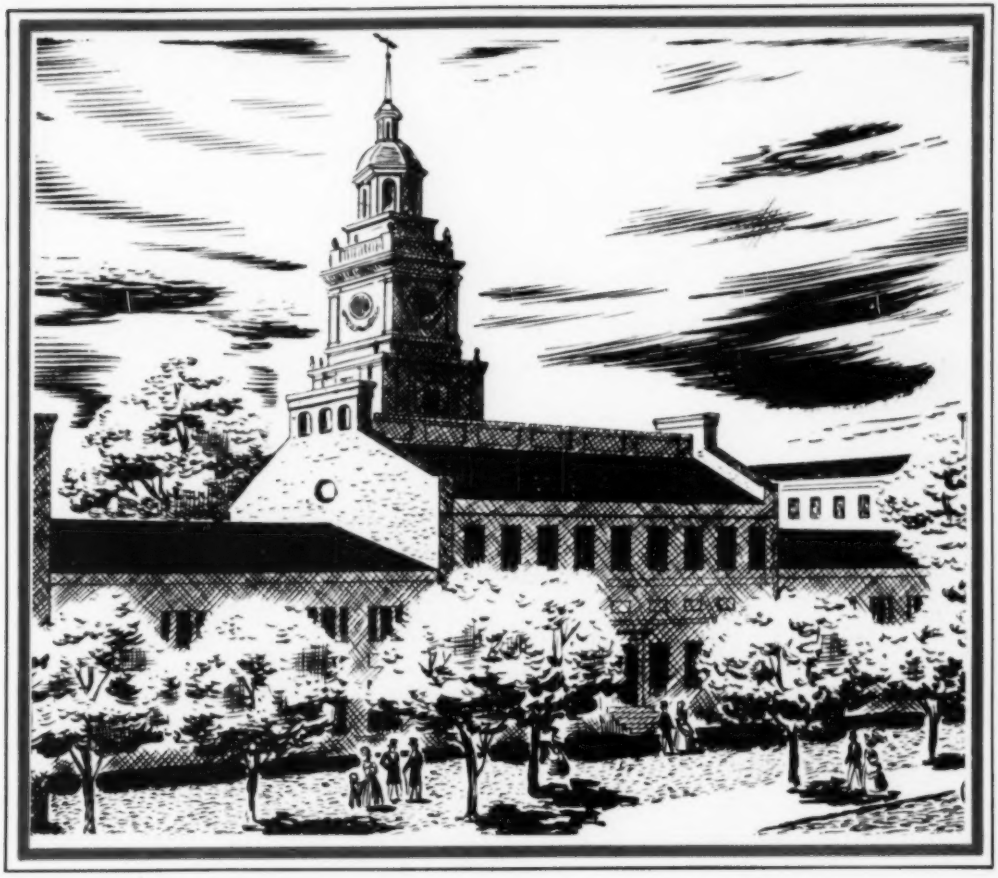
"EXPLAIN-MORE" DIAGRAM

the Accelator basin contains:

1. **A raw water inlet and distributing duct**
2. **A primary mixing and reaction zone**
3. **Two concentric draft tubes which form the secondary mixing and reaction zone**
4. **A rotor-impeller for mixing and pumping, driven by a motorized reducer**
5. **An effluent launder system**
6. **Concentrators to accumulate and remove excess slurry**


PLAN OF ACCELATOR
TWIN ACCELATOR FILTER PLAN
If for softening, a recarbonating basin is placed between Accelator and filters
TYPICAL ACCELATOR LAYOUT

SUGGESTED ACCELATOR APPLICATIONS / POSSIBLE TREATMENT REQUIREMENTS → / WATER END-USE	SOFTENING	CLARIFICATION	STABILIZATION	ALKALINITY REDUCTION	ORGANIC MATTER REMOVAL	TASTE AND ODOR REMOVAL	COLOR REMOVAL	IRON REMOVAL	SILICA REDUCTION	NEUTRALIZATION
MUNICIPAL	X	X		X	X	X	X	X		
PULP	X	X		X	X		X	X		
PAPER	X	X		X	X		X	X		
BEVERAGES		X		X	X	X	X	X		
COOLANT	X	X	X	X	X			X		
BOILER FEED	X	X		X	X		X	X	X	
RAILROADS	X	X					X			
TEXTILE	X	X			X		X	X		
CANNERIES		X		X	X	X		X		
BREWERIES		X		X	X	X	X	X		
OIL FIELD FLOODING		X	X		X		X	X		
BRINE DISPOSAL		X	X		X		X	X		
INDUSTRIAL WASTES DISPOSAL AND REFUSE		X	X		X		X			X



Philadelphia's Independence Hall, where the Liberty Bell is housed, as it looked 100 years ago

Philadelphia has cast iron water and gas mains in service that were laid well over a century ago. One of them is America's oldest cast iron water main, still functioning despite the radically changed conditions of street traffic and underground utility services in 100 years. The fact that cast iron pipe, laid generations ago, withstands the shock of heavy-duty traffic and the stresses caused by congested underground structures, amply demonstrates its shock-strength and beam-strength. Because of these strength factors and effective resistance to corrosion, cast iron water and gas mains, laid over 100 years ago, are still serving in the streets of more than 30 cities in the United States and Canada. **United States Pipe and Foundry Co., General Offices, Burlington, N. J. Plants and Sales Offices Throughout the U. S. A.**

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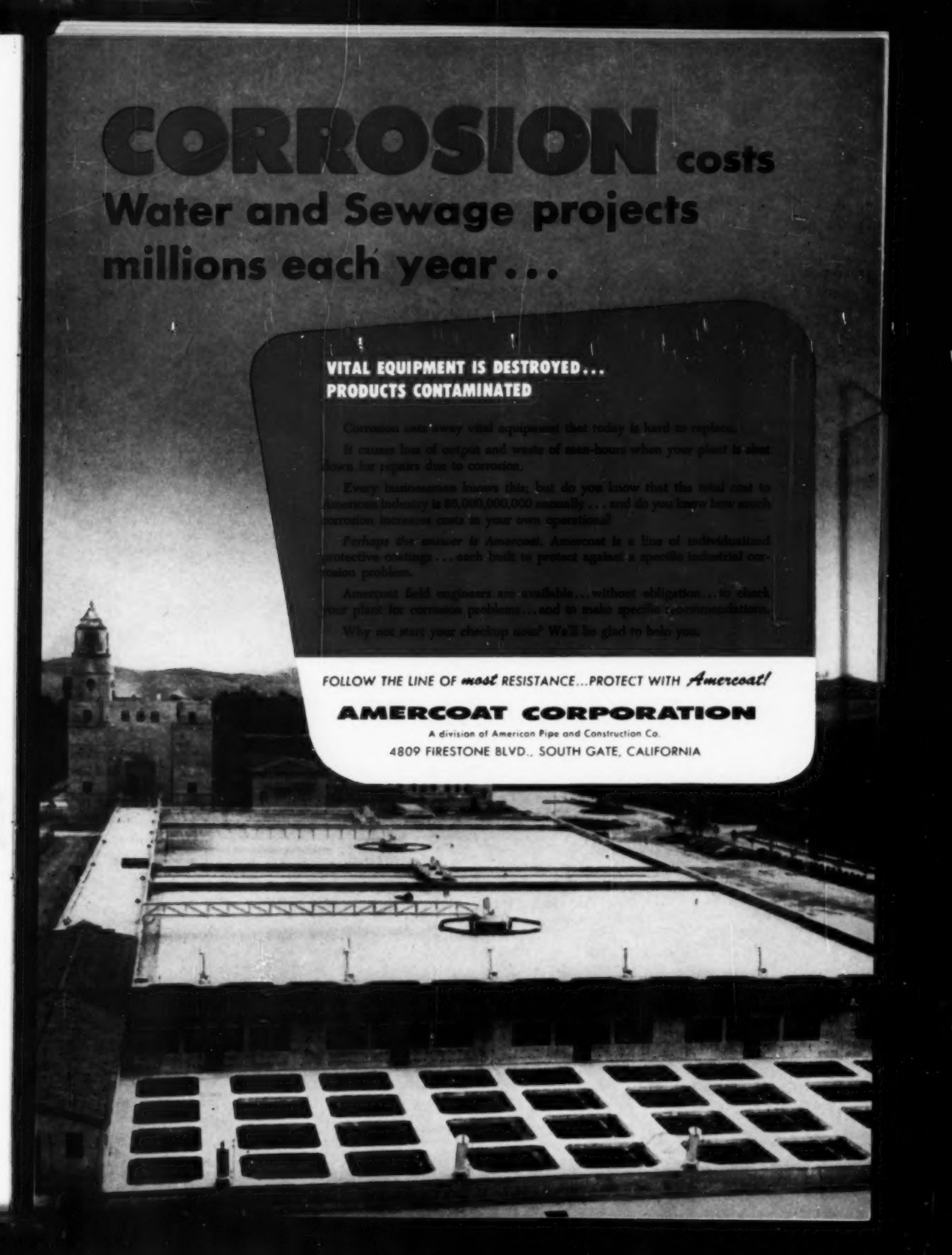
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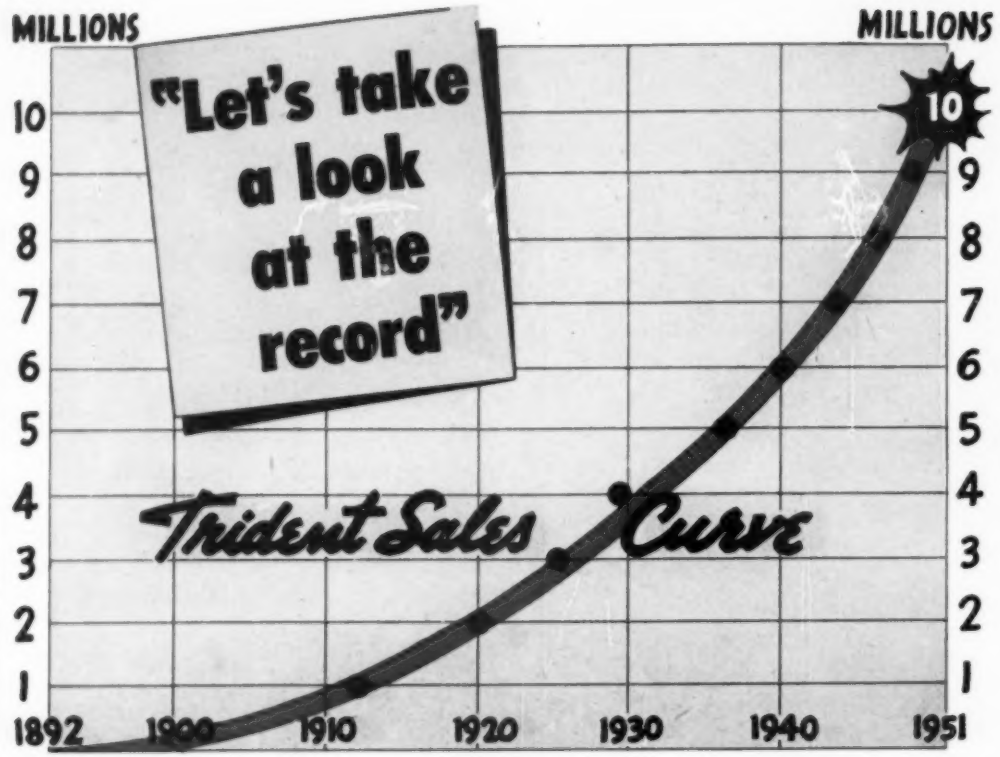

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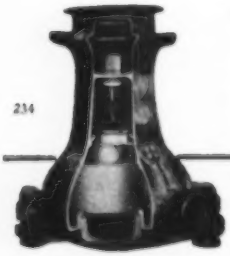

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WATER & SEWAGE WORKS

VOL. 99, NO. 1 • A GILLETTE PUBLICATION • JANUARY 1952

DORRCO "Hydro-Treators" at Miami's new 40 mgd. plant

Water Supply–1951

A review of developments, progress and trends of the year.

by **ALBERT E. BERRY***, *President, Am. Water Works Assn., Toronto, Ontario.*

THE year 1951 can be recorded as a difficult and confusing time for water works. This was due mainly to shortage of materials and discouraging initial efforts to obtain recognition of the need for these critical materials while combined with an unsurpassed demand for extension of water works services. Urban growth and industrial expansion called insistently for water. In spite of these perplexities notable progress has been made, and water works men have again proven their efficiency, devotion and capacity for public service under adverse conditions.

Critical Materials

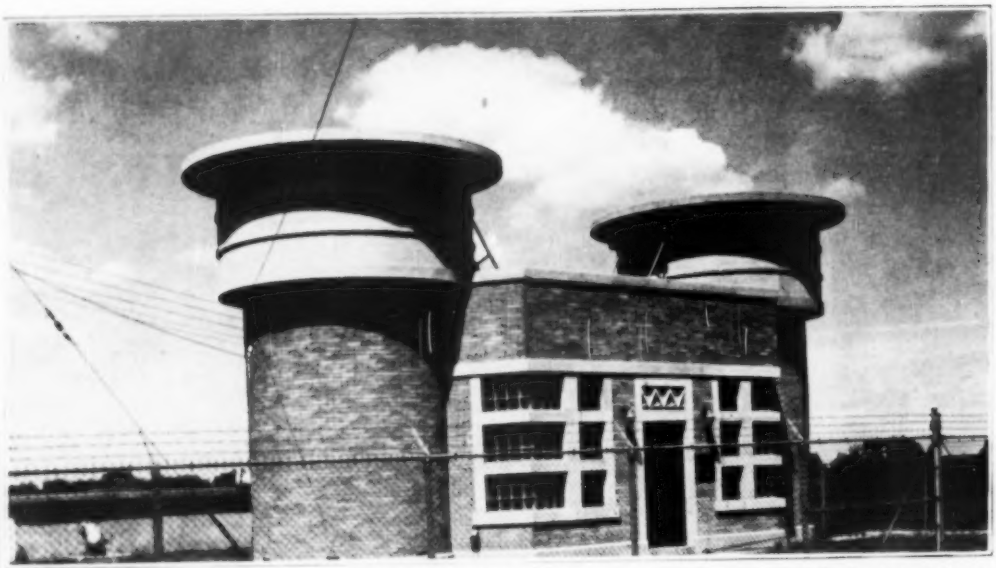
The year brought marked changes in the administration of critical materials. This has been an acute problem ever since the defense program began diverting these materials from the normal civilian channels. No such major change can be expected without some confusion and remedial planning.

It is seldom easy to convince those whose outlook is primarily in the military direction that water supply is one of the essential elements in the national program. This importance is more readily apparent as industry expands. It then becomes obvious that without adequate water supply goods can not be produced nor residences provided for the required personnel. Such a situation has been experienced in all too many instances where water extension has lagged behind the construction projects.

The early administrative arrangements for dealing with these water works materials were not satisfactory to those engaged in this industry. It was made plain by the American Water Works Association that a claimant agency at Washington was necessary in which proper consideration would be given to the needs of water works. It must be manned by a staff familiar with these problems. Only in this way could the water works group be expected to play its vital part in the defense program.

Action to bring this program into effect was given concentrated study at the Miami meeting of the A.W.W.A. in May. The large amount of work done previously on this measure was supplemented by bringing forcibly to the attention of those high in the Federal administration the necessity for setting up at once a claimant agency which could deal with water and sewage works needs. The action taken at the meeting was successful, in that the requested decision was announced from Washington. A Water Resources Division was organized in the National Production Authority with

*Director, Sanitary Eng. Div., Ontario Dep't. of Health, Secy. & Treas., Canadian Section A.W.W.A. and Past-president Federation Sewage Works Assn's.



MODERN 1.25 mgd iron removal plant of Aurora, Ill., equipped with two Walker Ironremover units. This is one of twin plants at Aurora.

Mr. Harvey Howe in charge, to be followed later by Mr. G. E. Arnold, both having had considerable experience in this type of administration during World War II.

The creation of this agency was followed quickly by setting up procedures which would be followed by water and sewage works groups in requesting critical materials for their needs. The agency is now functioning effectively in the direction of securing materials needed in the more essential construction and extensions of water supply facilities. In this greatly expanded national effort the supply of material is considerably short of the demand, and allocation must be made between the various groups, based on the relative importance of each. Thus water works asks only for its fair share of these materials which will enable it to meet its important national obligations.

In this present program for handling critical supplies emphasis is placed on those controlled materials which include basic forms and shapes of steel, copper and aluminum. The order required that no person after September 30, 1951, might commence any types of construction or continue a project which requires the use of more than two tons of carbon steel, 200 pounds of copper, or any quantity of aluminum, alloy steel, or stainless steel without authorization and allotment of material. As time goes on the procedure has become better known and the operation more efficient. What proportion of the needs of water works can be met without delay remains to be seen. It is apparent that restrictions are inevitable for a period of uncertain duration. The best hope is that this time of shortage will not be excessive. The co-operation of water works personnel can be assured in meeting this critical world situation.

Shortage of chemicals for water purification has been a threat to water works operation. Among these may be mentioned chlorine, alum and fluorine compounds. Fortunately this situation did not reach the critical stage before appropriate action was taken to ensure to industry sufficient supplies to maintain regular deliveries to water plants.

Water Resources

The water resources of the United States have occupied an important place in the discussion of water works groups. The report of the President's Water Resources Policy Commission released over a year ago has been examined critically by many groups. No pronouncement by the Government on further action has been made during the year.

This report was reviewed in some detail at the Miami Conference of the A.W.W.A. Three papers by Messrs. Morris, Wolman, and Pirnie, as well as a panel discussion focussed attention on all water supply phases of the report and its recommendations.

When the Commission was set up in January 1950, it was asked to give the broadest consideration to the problems resulting from the interdependence of water and related land uses on the river systems and drainage basins of the United States. The Commission was asked to make recommendations for a national policy to guide the government's action.

The Commission came to the conclusion that the river basin should be the fundamental unit for planning of water and related land uses. This called for the creation of river basin commissions composed of representatives of the states and federal agencies under a chairman appointed by the President. Another recommendation proposed a federal board of review to co-ordinate the functions of the river basin commissions and assure the carrying out of a single uniform national water resources policy. Since most river basins are relatively undeveloped, there is still time to make the necessary plans and proceed with co-ordinated programs of water resources development.

Criticism of the report has been voiced in that the necessity of preserving local responsibility is in contrast to the appointment of river basins so largely dominated by federal personnel. The payment for these works is a further point of criticism. The Engineers Joint Council, with benefit of service of several members of the Am. Water Works Assn., has reviewed the various recommendations of the report and has issued its criticisms. It was believed the Congress should test every request for federal construction and operation of works to regulate the water of any river basin.

and if it is for the common good, only then should it be authorized.

It seems clear from the discussions which have taken place that there is need for some clear policy on water resources, but it can scarcely be expected that any proposals so far offered will meet universal acceptance. It is now for the federal government to announce its action on the report and to follow through on its decisions.

The management of water resources by the States and other areas is being given constant attention. The administrative features in this are variable, but co-operation between the areas concerned is the keynote to the success of these measures. While the great majority of municipalities are able to secure water in proximity to their boundaries there is increasing evidence of the need for bringing water long distances to supply large urban centers or a group of communities. This is recognition of the fact that while the water supply of the earth is adequate it is not always available where needed. These long pipe lines are expensive and it is natural to have these costs shared by as large a population as possible. Many of these schemes have been in operation for long periods both in the United States and Canada. They have proven successful. It can be expected that many more will be developed in the years to come, especially if industrial expansion requiring great quantities of water is to take place at points less favorably situated in respect to abundant surface waters.

These metropolitan districts or areas must possess suitable legislative authority at State level, and management must be flexible enough for best results. These projects are found in many States and in two provinces of Canada. Some apply only to the development and delivery of the source of supply while others are concerned with the entire operation from source to faucet. It is apparent that there is a significant opportunity for utilization of our water resources in the combined efforts of many communities in contrast to individual effort.

Much attention has been given to the development and management of underground water supplies. In two papers given at the Miami Conference of the A.W.W.A. by members of the United States Geological Survey emphasis has been placed on the factors affecting perennial yield of aquifers in general, as well as those in the Miami area. They point out that the most urgent problems in development and use of ground water are those relating to the perennial yield or aquifers. Many factors influence this, and underground water resources can be used successfully only with a full knowledge of the available supply and best methods for withdrawing and replenishing it.

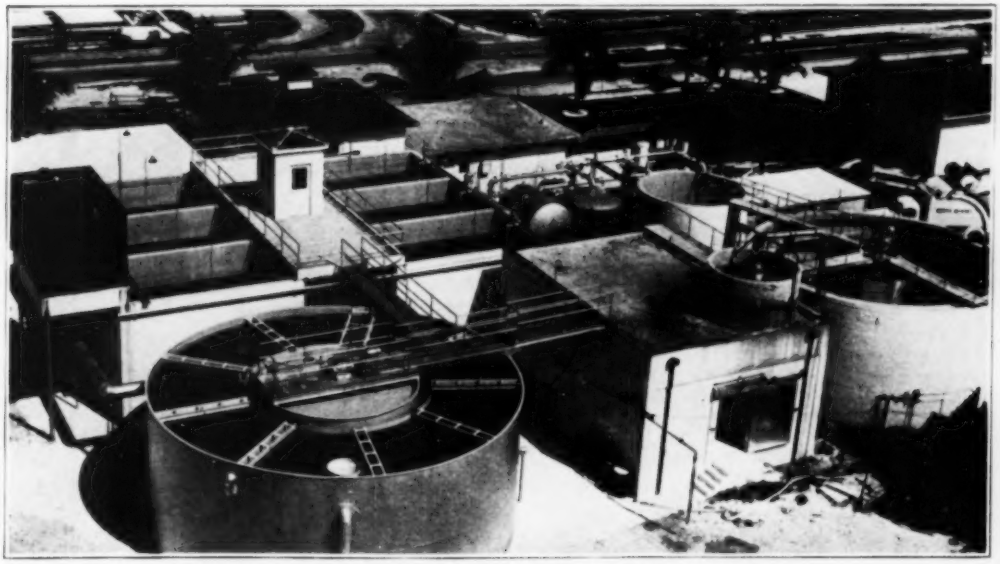
Effects of Floods

Once again the effects of terrifying floods have been felt by a large population. These are always to be feared since they are so destructive of life and property. They are especially significant to water works operators when they prevent the distribution of water as the result of damage to the water mains or flooding of the supply works.

In 1950 the City of Winnipeg and environs were the scene of disastrous flooding. The following year the State of Kansas bore the brunt of floods which reached an unprecedented height. In the former, the water works system continued to function and to deliver water to all areas which had not been evacuated. In contrast to this the Kansas flood put many water supply works out of operation due chiefly to power failure and to flooding of the works themselves.

The Kansas floods in July of 1951 exceeded all previous records in at least four streams. Damage was estimated at a billion dollars.

In the Kansas flood a large number of water plants were out of service. Power failure was prominent, and the experience again emphasizes the importance of protection for power supplies, as well as the need for auxiliary power for emergencies. Water plants and clear water reservoirs built in river valleys and at low elevations were submerged. This would call for consideration of plant location on higher sites even if the initial costs and operating charges are somewhat higher. The flood further demonstrated the value of elevated storage. By rationing these



ENLARGED softening plant of North Miami, Fla., Infilco's "Accelator" in left foreground.

NEW toro-segmental 2 mg. elevated tank, erected for Dayton, Ohio, by Pittsburgh-Des Moines Steel Co.

stored supplies the problem was made less acute.

This flood has brought to light once more the severe damage that can occur to water works systems. It has revealed that new flood peaks are always possible. The fact that it hasn't happened before, like so many other actions in the water supply field, is no assurance it will not happen in the future. Preparedness and careful planning during construction can do much to preclude these effects.

Water Fluoridation Grows Apace

It is doubted that there has ever been a development that has focussed as much attention on the community water supply as has the introduction of fluoridation. There have been marked advances in the use of this measure aimed at checking dental caries on a mass basis. Knowledge has increased, both as to the results which may be expected and on the methods of application and control. There is a gradual and sure clarification of knowledge, and it may now be expected that in the near future the results of this venture in water supply practice will be clearly defined. It will be so standardized that little doubt will be left in the minds of the public concerning its real capability and the extent to which water fluoridation controls dental caries, a problem which in the past has offered a real challenge to dental and public health groups.

The developments in fluoridation practice in recent years occupy a most interesting place in water works. The three cities of Grand Rapids, Mich., Newburgh, N.Y., and Brantford, Ontario, that adopted the treatment in 1945 set out to determine whether the same results might be expected when the fluoride ion is added artificially to the water as when it is present naturally. During that interval there was intensive research on all phases of this problem. From all this it has been concluded that fluoride has no injurious effect on the consumer, and that artificial adjustment of this constituent can be expected to give results similar to those where it is found to occur naturally in the proper quantity for protection of the tooth.

It is well at this time to recall the action taken by the American Water Works Association in June, 1949, when, as the first organization to make a policy statement on this matter, it went on record as follows:

"In communities where a strong public demand has developed and the procedure has the full approval of the local medical and dental societies, the local and state health authorities and others responsible for the communal health,—water departments or companies may properly participate in a program of fluoridation of public water supplies."

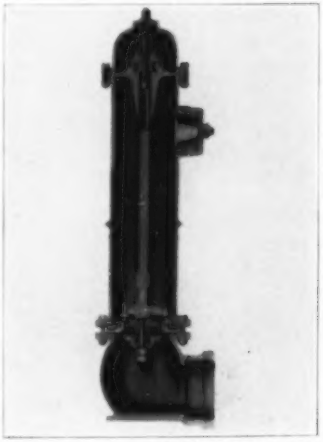
The Association's position was reaffirmed in May, 1951, in these words:

"Recommendations for fluoridation are the prerogatives of the dental, medical and public health groups. When the proper authorities approve the treatment, it then becomes the function of the water works utility and industry to follow through willingly and intelligently where proper controls are assured."

Endorsation of fluoridation has now been given by many of the professional groups referred to in the statement of the A.W.W.A. They include the U.S. Public Health Service, American Dental Association, American Association of Public Health Dentists, American Public Health Association, State and Territorial Dental Directors Association, and State and Territorial Health Officers Association.

Local municipalities all over the continent have recognized the significance of the studies made and the endorsements given. There is, as a result of this, a strong and growing interest in getting this procedure into operation. The public has been aroused, and water departments are co-operating effectively in the program.

The progress made to date may be seen in part by the number of communities which have either started fluoridation or have made plans to do so. The State of Wisconsin took the lead in the number of installations. Strong support from the dental, medical and public health groups has been responsible for increasing the total number of installations either in use or planned for immediate start to over



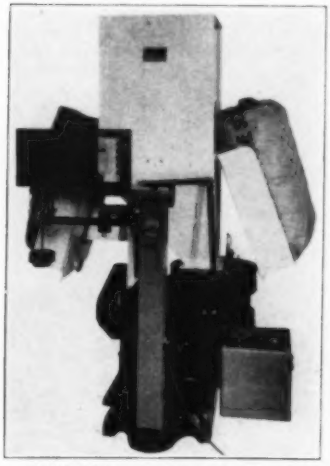
DARLING'S improved ball-bearing hydrant—1951.

150. The treatment is being adopted so rapidly that figures are not accurate for any length of time. In the early part of 1951 a survey of the States revealed 68 installations operating, 80 approved, and 68 approvals pending. By the end of 1951 this number was greatly increased to where it involved over 22 million people. The number of fluoridated supplies is expected to exceed 300 by the end of 1952, and the population served upwards of 30 million.

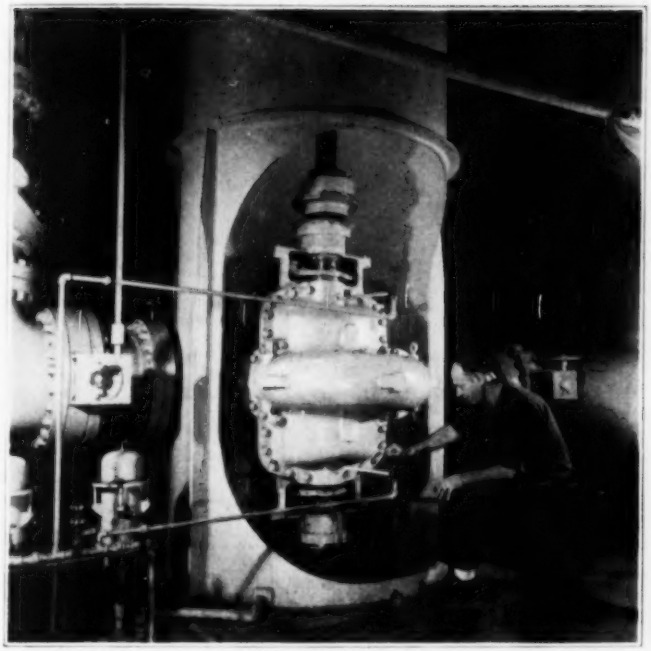
There has been some discussion as to what is involved in the use of fluoride in water. It seems unfortunate that at the outset of these studies the addition of fluorides to public supplies was referred to as mass medication. This is not the case, but rather is it an adjustment (fortification) of the trace elements in water. Sometimes too much fluoride is naturally present, other times too little, and it becomes necessary to adjust this to the benefit of the consumer. A survey has revealed that in 32 states investigated approximately 3 million people are served with water naturally containing from 1.0 to over 5.0 ppm. of the fluoride ion. The small adjustment necessary can be visualized when it can be accurately calculated that if a person were to drink on the average eight glasses of water a day containing 1 ppm. of fluoride it would require seventeen years to consume one ounce of sodium fluoride. This amount is just one heaping teaspoonful.

The results to be expected from fluoridation are based on figures in centers where it has been used for some time. The D.M.F.* rate for children should be lowered by about 60% to 65%. Surveys in communities consuming waters of natural fluoride content reveal that this benefit is likely to be carried through adult life, although much less work has been done on adult studies than on children.

*D.M.F. is the designation dentists use for decayed, missing and/or filled teeth.



OMEGA'S improved Fluoridizer—1951.



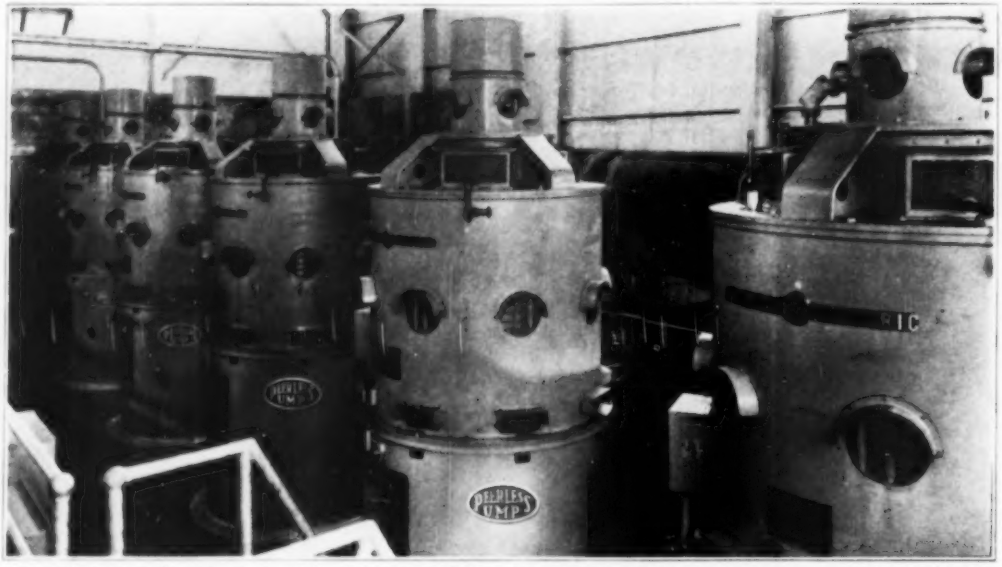
UNUSUAL high-lift pump installation, at Gary, Ind., one of four single stage double suction Allis-Chalmers motor-pump units, rated at 14,000 gpm against 160 ft. head.

The early fluoridation installations all used sodium fluoride, but it has now been shown that sodium silicofluoride is satisfactory, and is much less expensive. Hydrofluosilicic acid is also available but is more expensive. In small installations the cost of the chemical is unlikely to be the deciding factor, but rather which chemical can be handled most conveniently. The chemical cost is accordingly estimated under these varying conditions to be between five cents and fourteen cents per person per year. In 1950 the cost for sodium fluoride was eleven cents per capita at Brantford, Ontario.

The methods of applying fluoride have undergone considerable development. The equipment for this purpose can now be tailored to the local needs. For small supplies solution feed machines similar to those used for feeding hypochlorite solutions offer advantages. The larger supplies can be served by dry feeders of the volumetric type or by gravimetric feeders with automatic controls. There is thus a choice for each water plant operator. It is the responsibility of the water works operator to select the equipment and supervise the operation to ensure the desired dosage can be maintained.

Some features of feeders are worth noting. Hydrofluosilicic acid involves minimum chemical handling. It can be delivered by a diaphragm proportioning pump or related type direct from the acid storage to the point of application. This at present appears feasible only for small supplies. Dry feeders for medium and large size plants for gravity feeds are convenient and effective. The use of dissolvers with these, possesses advantages with subsequent liquid feeding automatic proportioning installations, either for start and stop arrangements or for proportioning the chemical to varying flows. Much thought has been given to the handling of the chemical and especially to reduce the spread of dust. Every effort is needed to ensure convenience in this handling operation. The use of canopies for the container when it is being emptied is helpful.

Variation of the dosage of fluoride to the air temperature has received attention. Since more water is consumed in warm weather it is argued that a lower dosage of fluoride may be sufficient. Dosages proposed vary from 0.7 or 0.8 in warm weather to



EMERGENCY 100 mgd pumping station of New York City at Chelsea, N.Y., equipped with 6 Peerless turbine type pumps driven by 2500 hp G-E motors. Will pump Hudson River water in case of need at anytime.

1.5 in cold weather. This practice would involve greater administrative problems, and the extent to which this will be recommended in the future remains to be seen.

The decision to fluoridate or not has been submitted to the voters in at least two instances. In one, it was rejected, but the latest test of public opinion in San Francisco was in the affirmative. Unless an effective educational campaign precedes such balloting it will be difficult to place much emphasis on them.

Raw Water Quality and Pollution Correctives

The quality of water delivered to the consumer is to a large extent influenced by the raw water reaching that plant. Quality involves not only bacterial considerations but also impurities which may affect the taste or in any way cause injury or objection from the consumer. The plant operator expects raw water which can be processed and made suitable without undue difficulty or unwarranted cost. This condition must be related closely to stream pollution control measures.

During the year there has been a substantial advance in pollution investigation and correction. It is now recognized that industries and municipalities must treat their wastes to a degree where they will not objectionably foul the receiving waters. They must not make these waters unsuitable for drinking purposes or interfere with the many other demands placed upon them. The desire for good stream sanitation and the curtailment of pollution is greater than at any time in the past.

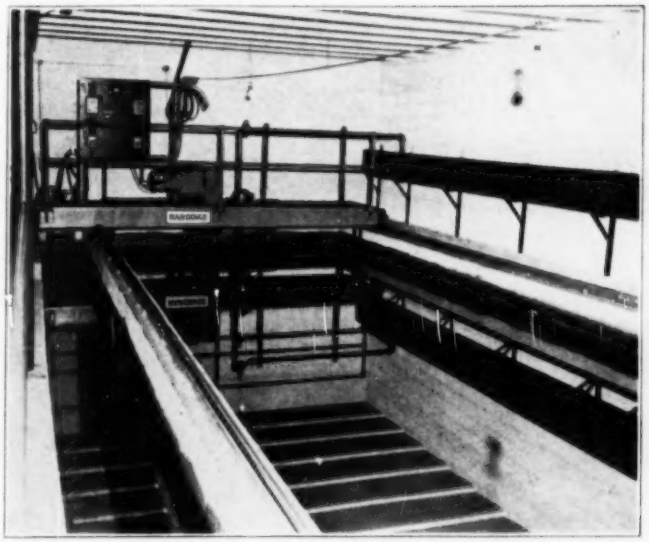
In this program very considerable thought has been directed to suitable yardsticks or standards for determining stream sanitation and raw water quality. At purification plants many standards have been formulated, based chiefly on the extent to which coliform organisms are present, the biochemical oxygen demand of the wastes, as well as specially named chemicals which may have a degrading effect on the water or cause complaint by the consumer.

One serious difficulty in raw water quality evaluation is that there is no universally applicable yardstick for stream pollution. This is due in part to the fact that domestic sewage in many instances is no longer the difficult problem, but rather is it industrial waste with all its many variations. Industrial processes must change frequently, and some produce wastes for which no suitable treatment or disposal process has been developed. The

BUILDER'S high capacity gravametric feed chlorinizers installed in N.Y. City's emergency Hudson River pumping station—6,000 lbs./day capacity each.

antibiotic products are changing rapidly as are dyestuffs and many other industrial goods. Comparison of these wastes with the standards used in the measurement of sewage may be quite misleading. Population equivalents, although widely used may be inappropriate in the assessment of a specific waste when considering its probable effects on a water supply. The action of sewage, organic pollution and commonly used chemicals can be judged with reasonable accuracy by the use of standard procedures. For the others it will be essential to apply experience and keen observation. These are present day problems which are being recognized by all who see the close relationship between waste disposal and water uses.

There is gratification and encouragement in the present attitude that stream pollution must be controlled and reduced to the point where it will be harmless, even though this involves large expenditures. While the treatment of sewage is well standardized there is much to learn about industrial wastes. Much of this needed information is being obtained by industry itself, and there is a clearer recognition than ever before that the prevention of stream pollution must be an integral part of all new plants and processes. The cost of this must be included in the cost of the product. Industry has found that much can be done to prevent the discharge of these wastes by better housekeeping methods and/or process modifications. There can be considerable economy in those pollution abatement measures which recover usable products. Industry is also interested in the quality of the water it derives from a stream, and is thus concerned with what happens upstream.



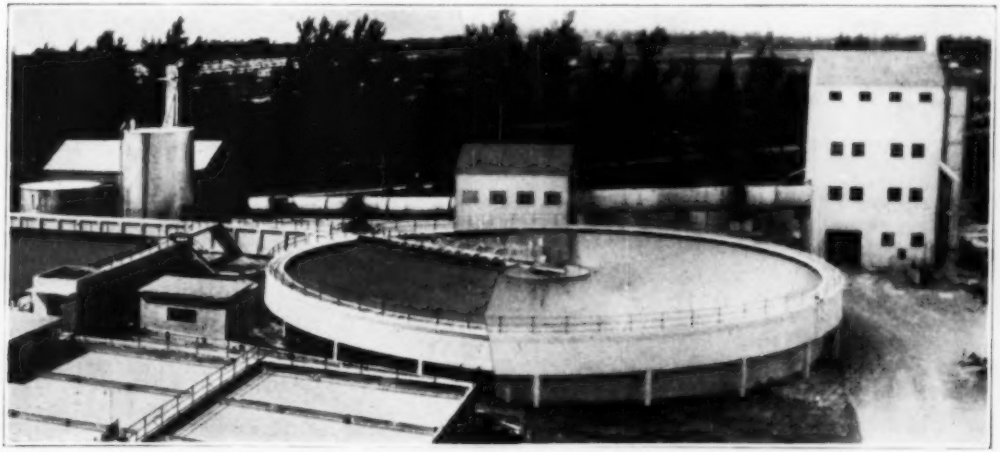
HARDINGE automatic back-wash sand filters installed at the Winooski, Vt., filtration plant.

Pollution control programs have been developing rapidly in recent years, with the adoption of new legislation, administrative procedures, and the formulation of stream quality objectives or standards. Water resources commissions, river compact commissions, and health agencies have attempted to utilize specific figures as guides for stream sanitation. These advise industry and municipalities as to what is expected of them.

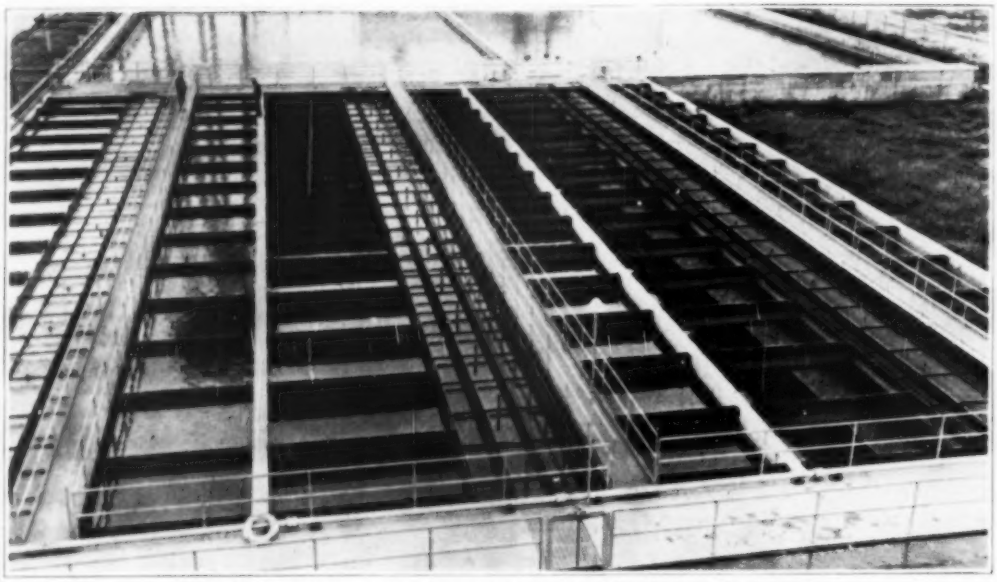
Uniform Legislation Desirable

A suggested State Water Pollution Control Act, drafted by the United States Public Health Service, has for its purpose interstate cooperation for a more concerted attack on water pollution. If adopted, this would bring legislation uniform in principle. It deals with water quality for all legitimate uses. It avoids such practices as exemption of specific industries or geographic areas and classification or zoning of streams for defined purposes. This is a further step in an attempt to bring improvement to water quality on a national basis.

The extensive investigation of pollution in the boundary waters between the United States and Canada was



LIME RECOVERY plant of the Miami softening plant, as seen across one of the clarifiers.



PERMUTIT Precipitators serving the Davenport, Iowa, plant of the Aluminum Co. of America.

published by the International Joint Commission during the year. This contains objectives for water quality control. These are not hard and fast standards but rather are they intended to serve as a guide to a determination of the sanitary quality of that water. In setting these objectives due recognition was given to the several uses for which these boundary waters are employed. No attempt was made to zone the waters, but the one set of conditions was formulated for all parts. Bacterial pollution was only one of the many factors which had to be considered. In fact it was less significant in many places than the other wastes arising chiefly from industrial processes.

An examination of these objectives and a comparison with those of other agencies reveal some interesting conditions. The objective set for bacterial pollution was a median M.P.N. value for coliforms not to exceed 2400 per 100 ml. at any point in the waters following initial dilution. This is to apply to all places where the water is to be used for domestic supply, for bathing, recreation or other purposes. It is in contrast to the figure set by the Ohio River Valley Water Sanitation Commission of an arithmetical average of 5,000 per 100 ml. at river intakes for any one month, and not to exceed this number in more than 20% of the samples during any one month, nor exceed 20,000 in more than 5% of the samples. There is also a variation from the figures for the state of New York set by the Water Pollution Control Board under a zoning plan.

The objectives as defined by the International Joint Commission also contain figures for chemical wastes including phenols, iron, oils, acids and alkalies, and toxic materials. These figures are given at two points, the effluent from the plant, and the stream following initial dilution.

The Ohio River Valley objectives, published during the year, not only set a figure for bacterial quality of the water at the intakes, but also stipulate one of 1,000 coliform organisms per 100 ml. for bathing or swimming areas based on arithmetical averages for any one month during the bathing season. Similarly, objectives are prescribed for chemical and other wastes. No zoning system is included in the objectives, as contrasted with the New York procedure.

These objectives as well as many other point the way to an improvement in raw water quality and the easier production of a high quality supply for domestic use.

Water Examination

Considerable interest in water analyses has been seen in the work done on the so-called Molecular Filters. A paper given at the California Section meeting in October by Goetz and another by Kabler brought up to date the work that has been going on in the United States in respect to these ultra filters. The original filter, as tried in Germany, has been under experiment and development in this country. The authors claim that its use in the laboratory is now at least as good as methods included in "Standard Methods," and has a decided advantage for low count waters, but there is much yet to be done in its general application in water examination practice.

The molecular or membrane filter functions to remove bacteria from the water as it passes through a special funnel to the filter. This material is fine enough to prevent the passage of bacteria. These are then cultured by placing the filter on top of a nutrient pad. It is thus possible to make a total count as well as a coliform count when an indicator medium is employed. The results are actual counts rather than "most probable numbers." This procedure holds promise of a very substantial change in water examination procedures which should in turn provide additional protection to the public. It has the advantage of speed.

The committee for the revision of "Standard Methods of Water Analyses" is continuing its work in preparation for publication of the 10th edition. It is expected there will be a number of changes intended to bring improvements to certain of the tests.

Developments in Purification

Work towards improvements in water purification never ceases, either in design, operation or research. The literature of the year contained several articles on these.

Papers dealing with design of water purification plants have included analyses of recognized practices and newer measures. A paper by Hazen on Elements of Filter Design offered a critical analysis of the various elements entering into the design of a filter and its operation. A comparison between the practice in 1930 and now as obtained by examination of a selected list of plants gives some illuminating contrasts. In the former summary nearly two-thirds of the filters had perforated pipe laterals, as compared with only six of the fifteen plants built recently. The standard rate of 2 g.p.m. is still common but much higher rates are often used. Sand layers of 30 inches have been reduced to 24 inches to 27 inches. Relatively coarse sand up to 0.6 min. effective size is fairly common now, and the lighter gravity anthracite coal to replace sand has been more widely used in recent years. Most regent plants have included provision for surface wash, a feature which was not present up to a few years ago.

In the A.W.W.A. sessions of the Purification Division at Miami, contributions were made to the water treatment literature. The use of copper salts in water treatment as tried at Richmond, Va., was found to give control of biological post treatment growth throughout the system by the use of 1 ppm. of copper which is believed to form cupri-chloramine. The amounts of chemicals held in solution in the finished water at Richmond were copper 0.25 ppm.; residual chlorine 1.74 ppm., and ammonia, 0.3 ppm.

Further research in diatomite filtration at Los Angeles revealed diverse methods in the use of the precoat and the size of the media to be employed. Backwashing required 1% of the water. A comparison of a number of factors between the conventional rapid sand filter and the diatomite filter were in favor of the latter. Each water requires special study to develop the best operating procedure. Portable diatomite filters have been found in studies at the University of Illinois to be very attractive for emergency and small plant use.

Lime reclamation at the Miami water softening plant was reported to be particularly successful. A net operating profit of $169,000 was reported for the year 1949-1950, or a net cost of $8.25 per ton of lime recovered, as against $19.60 for purchased lime.

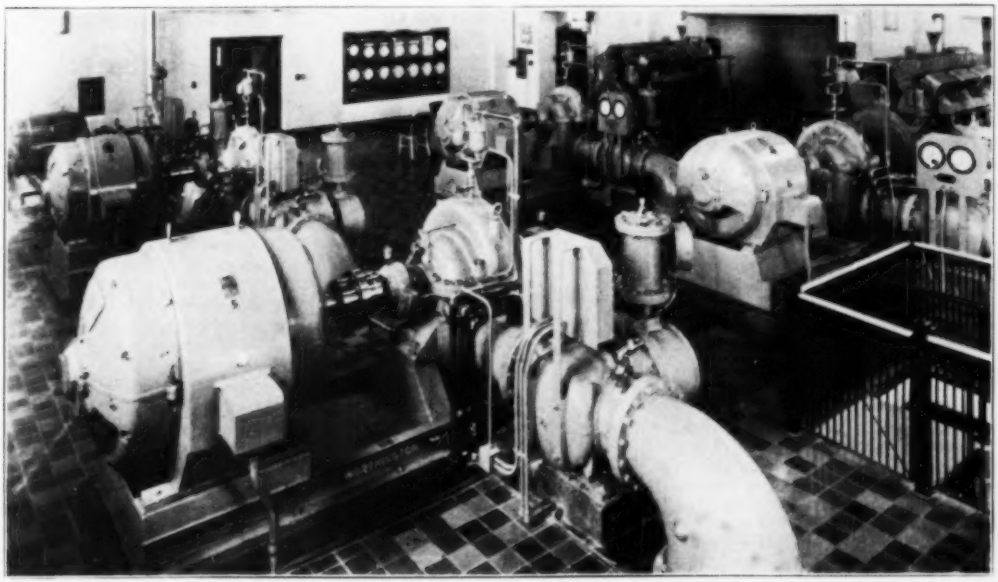
A continuous odor monitor and threshold tester was described at this meeting. It was developed at Chicago for a quick means of determining the type and intensity of odors in water. The water is heated to 120°F to 140°F and is then atomized by discharging through a spray nozzle inside a closed glass cylinder. The released odor can be detected readily by the operator.

Spaulding has reported on the results obtained on five water supplies when pulverized limestone was used as an aid to coagulation. Turbidity and color of the settled water generally improved. The filtered water was also better. More and better water, it was found, can often be produced with the same equipment and personnel. The limestone appeared to act also as a catalyst capable of steadying the performance of suspended solids contact basins as well as intermittent batch treatments.

Additional information has been forthcoming during the year on the control of taste and odor in water. Experiments at the water plants of Nyack and Ossining in New York state showed that the application of chlorine as an oxidizing agent to a free chlorine residual of 4 ppm. after a four hour contact, followed by dechlorination to 0.3 ppm., gave very satisfactory results. Other benefits were also secured and the operation of the plant was simplified. The factors affecting the efficiency of activated carbon have been reviewed and are shown to include the pH of the water, the time of contact, and combination with chlorine and other chemicals.

Williams, from his experience at Brantford, Ontario, has called attention to the presence of organic nitrogenous substances in raw waters as a distinct problem in purification.

The economics of water softening was dealt with in a paper by Howson in which he concluded that most public water supplies with a hardness of 125 ppm. or more will eventually be softened, and that consideration should be given to the installation of the neces-



NEW Pumping Station at Evanston, Ill. Low-lift pumps left foreground; high-service pumps right background.

PLASTIC pipe and fittings by Carlon of Cleveland available in flexible and rigid forms.

sary equipment to supplement filtration plants. The cost of softening is outweighed by the comport of water users and the savings, and it can be done more economically and satisfactorily in the public water works than by individual softeners.

At the October meeting of the Southwest Section, Silvey reported further on the relation between actinomycetes and algae in the production of tastes and odors in water. That author's work on lakes led to the conclusion that it was the action of actinomycetes on algae that was responsible for tastes and odors formerly considered to be due to the algae itself.

Interest in the removal of iron and manganese is shown in papers examining the present day methods for the correction of these chemicals in water. They may be done either in conjunction with softening or without. Chemical coagulation in various ways, and zeolites have proven successful. The problem is to determine in advance by detailed analytical studies which type of treatment is best suited. A combination of water softening with iron removal lends itself to the use of a number of methods utilizing advances over a period of years.

New Ideas in Filtration

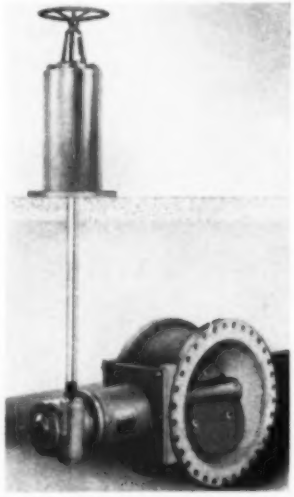
New ideas in water filtration are reported from several places. In Holland a ground water supply requiring the removal of ammonia, iron and manganese has been filtered by spraying the water over the sand and sucking the water and air down through the sand bed, thus securing areation and contact plating out of oxidized manganese and iron. In England, and at Chicago, experiments have been under way for the removal of microorganisms by straining through a micro-fabric wirecloth with 75,000 openings per square inch. The filter is cleaned by jets of water. Further data from Chicago show that an excellent quality of water can be maintained with sand filters operated at rates up to 5 gpm/sq ft.

In new filtration plants, the one at Alexandria, Va., incorporates a number of new features, particularly in the construction of the four treatment units, each of which contains complete facilities for mixing, coagulation, settling and filtration. The operation of the filters is controlled from a central board set in the wall. The latter resembles the board used at the new plant at Benton Harbor, Michigan. The filter sand at Alexandria rests directly on porous plates, thus eliminating the troublesome gravel bed and economizing on filter-depth.

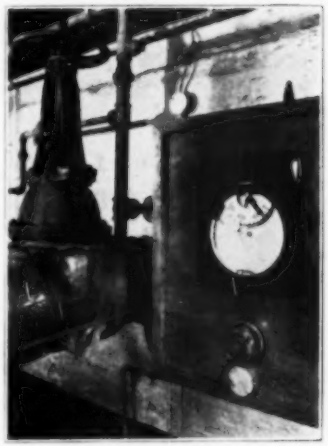
Chlorination and Disinfection

Disinfecting procedures in water supply, and the use of chemicals for many activities continue to advance. Research workers and observers find here a fruitful field for their efforts. The past year has not been lacking in these advances. Papers have dealt with various phases of chlorination, methods of disinfection by other means, and the use of chlorine in other than disinfecting procedures.

An analysis has been given on methods for determining residual chlorine compounds. New information on chlorination practices is continually coming forward, and it is thus more important to have accurate methods for knowing the quantity and kind of chlorine present. A paper by Marks, Williams, and Glasgow compares experience with the plain method and



R-S PRODUCT'S new heavy-duty valve of butterfly type.



FOXBORO'S Pumpage Controller serves as watch-dog to prevent over-pumping of wells.

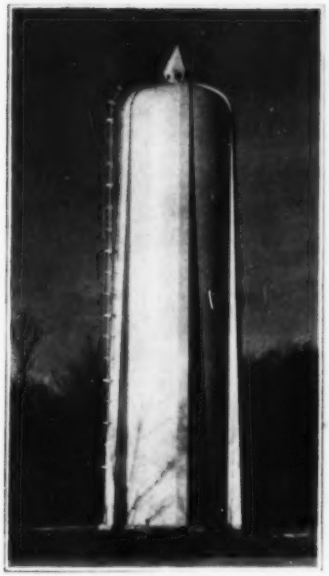
an amperometric titration to determine separately free chlorine, monochloramine, and dichloramine. The authors conclude that the Palin titration method is a useful qualitative procedure. For hypochlorous acid it is accurate and reliable. Its precision for the monochloramine fraction is satisfactory at lower water temperatures only, while for the dichloramine the method is somewhat erratic at low temperatures and is not usable at temperatures in the neighborhood of 25°C.

The amperometric titration, it is pointed out, can be modified by proper control of the iodide ion concentration and pH so that all three, hypochlorous acid, monochloramine, and dichloramine can be precisely and quantitatively separated.

Williams has further amplified his views on these determinations of various forms of chlorine in the Brantford water supply and has given details of the procedure for testing.

Information continues to accumulate on the value of amperometric residual chlorine recording. Hazey was summarized these advantages from his experience in the use of this equipment at Wyandotte, Michigan, on a water containing varying degrees of pollution. Among these he lists elimination of chlorophenolic tastes, accurate recording of free chlorine residuals, reduction of overall chemical costs, the recording of sudden changes in raw water demand, and a check on operating personnel chlorination practice.

A study of the chlorination of some phenolic compounds by Ettinger and Ruchhoft of the United States Public Health Service brings the conclusion that these materials fall into three



WATER TOWER of interesting design by Pittsburgh-Des Moines Steel Co., serves Arlington County, Va.—Capacity 225,000 gals.; diam. 22 ft.; water depth 80 ft.

principal groups as determined by the results of stepwise partial chlorination of 1 ppm. concentrations. The first of these includes phenol, cresol and o-chlorophenol. Their taste producing intensity is increased enormously by partial chlorination to a maximum after which there is a progressive decrease. Chlorination beyond the break-point resulted in substantially no chlor-phenol tastes.

The supply of chlorine for water treatment plants took a precarious position during the year when it appeared that supplies might not be available for the manufacturers to ensure the production of an adequate quantity. This was corrected by an order of the National Production Authority ensuring availability of chlorine in the quantity necessary for water supplies.

Breakpoint chlorination has proven effective in maintaining the carrying capacity of a 33 mile, 39 inch transmission line in the Little Rock, Ark., water system. The ammonia-chlorine treatment was only moderately successful. The break-point process was used successfully for nine years, and has now been replaced by intermittent application of high chlorine dosages for short periods. This shows promise of good results at lower costs.

Association Activities

The American Water Works Association has played a conspicuous part in the water works field during the year. The membership has risen steadily to nearly 9,000. The Miami Convention in May marked up another successful meeting at which notable contributions were made to knowledge. The headquarters staff have given efficient service to the membership, evidence of which is seen in the plan for controlled materials, fluoridation, specifications and publications. These activities are further proof of a central organization designed to spearhead advances in water works for this world wide organiation. Through these channels it has been possible for the sections of the association to hold successful meetings and to give that local service to its members which is so essential in the administration. The success which has attended these various section meetings is potent indication of the vitality of the entire Association.

Costs and Financing

Serious concern in water works during the past year has been the changing cost picture and methods for financing these required works and operation. Construction costs have continued to rise and with no assurance of where the peak will be found. These conditions have demanded consideration of rate structures and revisions which will keep pace with rising costs of materials and services. The fact that the capital costs of many water works systems were incurred at the lower figures has made it possible to absorb some of these newer charges without raising the rates.

NEWEST precision recording Fluoride Feeder by W & T.

GREENSBORO, N.C., boasts an attractive new 1.5 mg elevated tank erected by R. D. Cole Mfg. Co.

There is need for an intelligent analysis of the cost picture in all its phases. The financial requirements for extension of mains and services have given rise to much discussion. Urban populations have expanded greatly and industries have increased in size and in their water demands. This new situation has made it necessary to consider methods other than those commonly used in the past of issuing general obligation bonds. Many water works systems have been deprived of their surpluses and are now unable to meet these new needs. Consequently water departments have found it necessary to utilize water revenue bonds, general bonds, increased rate schedules, and higher fire protection charges. Revenue bonds appear to have gained much favor. There is also a considerable variation in authority given to municipalities in the issue of bonds of different kinds.

Rates and Rate Making

A report on water rates was presented at the Miami Conference by the Committee of the A.W.W.A. This reiterates the difficulties of reaching an understanding in a field which has been discussed by the association for 69 years. There appears to be no simple answer to these controversies. They involve a determination of the amount of revenue, the allocation of revenue among ratepayers and tax payers, and the rate schedules for both

MECHANIZATION of water and sewage works grew apace in 1951. Pictured, is Waukesha's "Hydrocrane".

normal and special users. All of these matters are subject to a wide variation in opinion, and the committee points out that the best answer for any particular community must be adjusted to local views, preferences and conditions.

An important contribution to the literature on rates was given in the issue of a joint committee report of the American Bar Association, American Society of Civil Engineers, with a number of other participating organizations, including the Am. Water Works Assn. and Federation of Sewage Works Assns.

This was prepared under the chairmanship of S. A. Greeley, Chicago. It is a valuable and comprehensive review of the principles involved in rate making for water and sewage works including revenues required, how they are to be obtained, and the allocation of the burden on the different groups.

Administration

Water works administration is a major business today. It is thus natural that much should be said and done about this during the year. The many aspects to this problem must be considered by management and by elected officials.

Regulatory control of several activities is common. The California Section of the A.W.W.A. has adopted tentative regulations governing water service. This may be considered as a guide to good practice to be observed by all water departments. It is thus a good contribution to administrative practice. State regulation of water utilities is also a subject upon which much has been done. These are in addition to the local controls adopted in each community. It is from the state that authority to put these controls into effect is obtained.

Administration calls for a consideration of those unusual demands as in air conditioning, as well as metering and other forms of equitable adjustment of supply and costs. Action on this has been taken in some cities, mostly in the form of requiring some kind of water saving equipment. This subject of air conditioning requirements was discussed at length at the New England Water Works Association's Conference as well as at the A.W.W.A. meeting at Miami. Rates in keeping with the demand for water above the normal use has had some advocates as a check on excessive use.

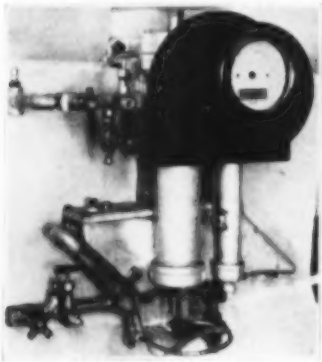
In the field of administration the Committee of the A.W.W.A. has many projects under action and which cover the entire water works field. The water works practice committee covers equally well the field of water works practice. These two committees ensure that members of the association will not lask guidance in these matters.

Administration must look well ahead for an adequate supply of water, and must plan for developments which will bring this water to the consumer as required. That is why many centers have their plans well advanced for these programs or have recently put them into force. Long pipe lines have featured these where communities cannot rely on nearby supplies to satisfy their needs.

Water works operators continue to have their heeadaches and tribulations, with the result that their recorded experiences in the literature, and elsewhere, are useful to others. In spite of these many problems they have been able to assure the public a service of the highest order.

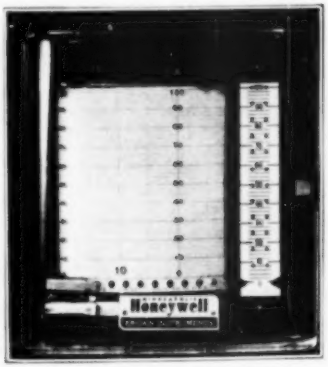
Equipment Developments—1951

In the field of water works equipment and supplies a number of new



SIMPLEX'S new Flow Meter Aid.

A. P. Smith's new mechanical joint cut-in valve and sleeve assembly.



"TEL-O-SET" process control unit by Minneapolis-Honeywell.

products have been announced by the various companies. Amongst these are to be found the following:

The Owens-Corning Fiberglas Corp. announced a new fiberglas outer wrap for pipe as a protection against underground corrosion.

Darling Valve and Mfg. Co. have completed the development of an improved fire hydrant with ball bearing operation.

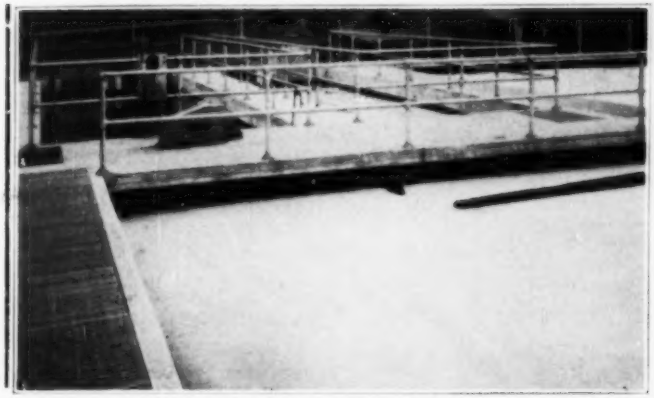
The Elgin Softener Corp. has developed a single tank deionizer to produce high quality, mineral-free water.

A flow meter aid consisting of tilting tube device which can be used in lieu of the standard mercury cylinders was announced by Simplex Valve and Meter Co.

Wallace & Tiernan Co. has a new portable chlorine residual recorder which can be disassembled and moved. It is useful for chlorine residual surveys on distribution systems. W&T also announced a new precision feeder for adding fluoride to water, both volumetrically and gravimetrically. A new "chlorinet" hypochlorinator was also marketed for precision feeding of small quantities of hypochlorite or fluoride solution.

Fisher & Porter Co. have a new V/A cell, a precision flow transmitter for differential pressure applications.

W & T's "Chlorinet" low capacity hypo-chlorite feeder.



LINK-BELT "Straightline" slow-mix installation at Steelton, Pa., water treatment plant.

Builders-Providence, introduced a new high capacity "chlorinizer" with feeding rates of 100 to 6,000 pounds per 24 hours.

R-S Products Corp. developed an off center valve of the disc type.

Ingersoll-Rand Co. announced a line of new multi-stage centrifugal pumps for high pressure applications to 1200 psi. and capacities to 1600 g.p.m.

Beckman Instruments placed on the market an automatic titrator for routine titrations.

Fairbanks, Morse & Co. developed a new submersible, self-priming deep well pump.

Sterling Electric Motors Co. announced a new electric remote control for electric power drives.

Omega Machine Co. introduced a new "Fluoridizer" with dust prevention during filling, and a new dry chemical feeder known as the "Chemizer."

The Gorman-Rupp Co. announced a new line of small centrifugal, all-rubber pumps for corrosive and non-corrosive liquids.

Analytical Measurements Inc. developed a pocket-size pH meter and probe unit for pH determinations anywhere.

A. P. Smith Mfg. Co. developed a mechanical joint cut-in valve and sleeve in sizes of 3" to 12".

Rockwell Mfg. Co. introduced a new compound meter manifold unit.

Reynolds Shaffer Co. announced a flow-regulating valve.

Mathieson Chemical Corp. developed high test calcium hypochlorite in tablet form and a special hypochlorinator for dissolving these tablets.

Minneapolis-Honeywell Regulator Co. developed a "Tel-O-Set" controller designed to improve process control.

A Year of Progress

Looking back over 1951 there can be little doubt but that important progress has been made in spite of adverse conditions. The water works industry is big and vigorous. There is thus every assurance that it will continue to go forward at a high speed.

San Diego Pumps Water Downhill

Faced with mushrooming Navy facilities, expanding industry and just plain more people, San Diego plans to increase its water supply 20 per cent by pumping water downhill.

The city's water comes from the San Vincente Reservoir by a gravity flow. To force more water down the system, the city fathers decided to install three Worthington Centrifugal Pumps. These pumps, powered by 200 hp motors, will boost the flow from 45 to 55 million gallons every day.

O'Brien Retires

With Binghamton, N.Y. Water Bureau 48 Years.

Starting as a meter inspector 48 years ago with the Water Bureau of Binghamton, N.Y., John L. O'Brien retired as chief clerk on December 1st. He had reached his 66th birthday. He had served under six different superintendents and for a span of 10 years (1932-1941) he directed all operations of the Bureau as acting superintendent and chief clerk.

Mr. O'Brien is widely known amongst water works men in N.Y. State and highly thought of. In his retirement letters to Supt. Grover Rickard, Mr. O'Brien calls attention to the fact that he had served the City of Binghamton longer than any other city employee. Mr. O'Brien's successor has not been named.

PIPE SAW completing 60 minute circuit around 48" pipe. Note clean true cut.

Pipe Cutting Experiences
With the Improved Wachs Pipe Saw

by DAN. W. ANGLIN, *Supt., Central District*
Water Pipe Extension Div., City of Chicago.

FOR a number of years the Central District of Chicago's Water Pipe Extension Division was plagued with periodical water leakage in their 48" feeder main line adjacent to the Western Avenue Pumping Station at 50th Street & Western Avenue. This 48" cast iron line, constructed with regulation bell-and-spigot lead joints lies approximately ten feet below the elevated main line tracks of the Pennsylvania Railroad.

Lead joints would not withstand the terrific pounding of passing trains over these high speed tracks. Leakage developed in this feeder under the tracks and a major project was required to excavate and repair the leaking joints. Not only that, but the railroad company also was forced to reroute all trains on their main line and furnish sufficient forces to maintain their equipment while the repair job was in progress. Leakage was disastrous in extremely cold weather, as accumulating frost disturbed roadbed and on one occasion caused the tracks to raise several inches, necessitating temporary discontinuance of all trains over them.

Finally a decision was made to eliminate the lead joints under the railroad tracks and join the pipe with special 48" Dresser couplings. To perform this type of construction required the removal of bells and spigots at four locations on the existing line.

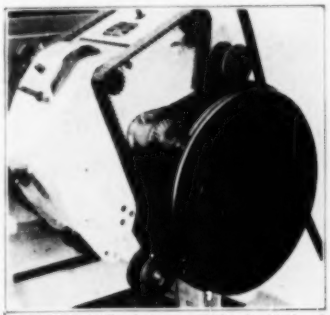
For many years we, in the Central District, had experimented with vari-

BEFORE—Wachs Pipe Saw starting cut of 48" main. AFTER—Completion of three of eight cut-outs of bell and spigot joints and installation of vibration-proof Dresser Couplings under four-track main line.

ous types of machines to cut large diameter cast iron water pipe. The success achieved with these machines was not particularly gratifying.

Improved "Pipe Saw" Investigated

In 1949 we visited the plant of the E. H. Wachs Co. here in Chicago to observe a demonstration of their new and improved pipe saw. We had used this machine previously and were attaining good results, with the exception that a shaft might bend, or some other slight mechanical failure would develop, which would slow down the cutting operation. However, after viewing the machine with its improvements and design changes, in operation, we were convinced that all the bugs had been eliminated. Cast iron pipe 10" to 24" in diameter was cut cleanly and quickly before our eyes in such a short period of time that we were amazed. Therefore, the City of Chicago purchased one immediately, with the idea specifically in mind of ridding ourselves of a headache with the 48" main under the Pennsylvania Railroad tracks. Prior to this time, we had dreaded the undertaking of



BUSINESS END of improved Wachs National Pipe Saw. Built in air motor drives the portable milling machine around the pipe on silent type chains which insure clean, true cut of cast-iron or steel pipe.

cutting into this large and important main.

In March, 1951, Central District's construction foreman, John Griffin, was assigned the job of installing the special Dresser Couplings. When the 48" line was uncovered and the trenches braced and shored, the Wachs Pipe Cutting Saw was installed on the bell end of the first length of 48" pipe. The saw was started, the cut begun and within a period of approximately sixty minutes the cut was completed. The same operation was duplicated seven times in this somewhat deep trench. We found that if the pipe saw is properly installed and observed closely to determine that it is following a straight line the cut can be made cleanly and quickly. The Wachs machine did not falter once in all of these eight cuts, which was a source of tremendous satisfaction to us. It can easily be seen that any time the machine failed, two crews (ours and that of the railroad company) would be stymied completely until the saw was repaired, or the cumbersome obsolete chisel-cutting type machine could be moved to the job and set up. One of the drawbacks of the old machine was that it took approximately three hours to set it up with a crane.

We are happy and satisfied with our Wachs National Pipe Saw and contemplate using it again in the immediate future to perform several other jobs of the nature of that herein described.

Cornerstone Laid for New York's Rockaway Sewage Treatment Works

Cornerstone Laying Ceremonies Rockaway Sewage Treatment Plant.

Cornerstone ceremonies were held October 26th for the Rockaway Pollution Control Project, last link in a four-plant program by New York City's Public Works Department to eliminate all dumping of raw sewage into Jamaica Bay and permit restoration of the entire area as the greatest recreational resort of its kind in any American City. The plant, being built by Merritt-Chapman & Scott Corp., is now approximately 80 per cent completed, and is scheduled for operation before next summer. The speaker in photo above is Joseph T. Sharkey, Acting President of the City Council, representing Mayor Vincent R. Impellitteri.

Designed for an initial capacity of 15 million gallons daily, the Rockaway Sewage Treatment Works will serve the entire Rockaway Peninsula of 4,736 acres, with an equivalent population of 90,000. The plant will use the activated sludge process and includes enclosed screen and grit chambers, pump and blower house, four aeration tanks, four covered sedimentation tanks, final effluent screens, chlorine contact tanks, four 50-foot diameter digestion tanks with floating covers and a 60 inch outfall sewer to Jamaica Bay.

Combined with three other plants already in operation, the Rockaway Pollution Control Project will permit treatment of all sewage entering Jamaica Bay. The three others are the Coney Island and 26th Ward plants in Brooklyn, and the Jamaica plant in Queens.

Rich Heads Sanitary Division at Virginia Polytechnic

Mr. L. G. Rich has been promoted to Associate Professor of Civil Engineering at the Virginia Polytechnic Institute and is now in charge of the Sanitary Division. He received the degree of Ph.D. in Bio-Chemistry in June 1951. During the past summer he worked on research at the University of California.

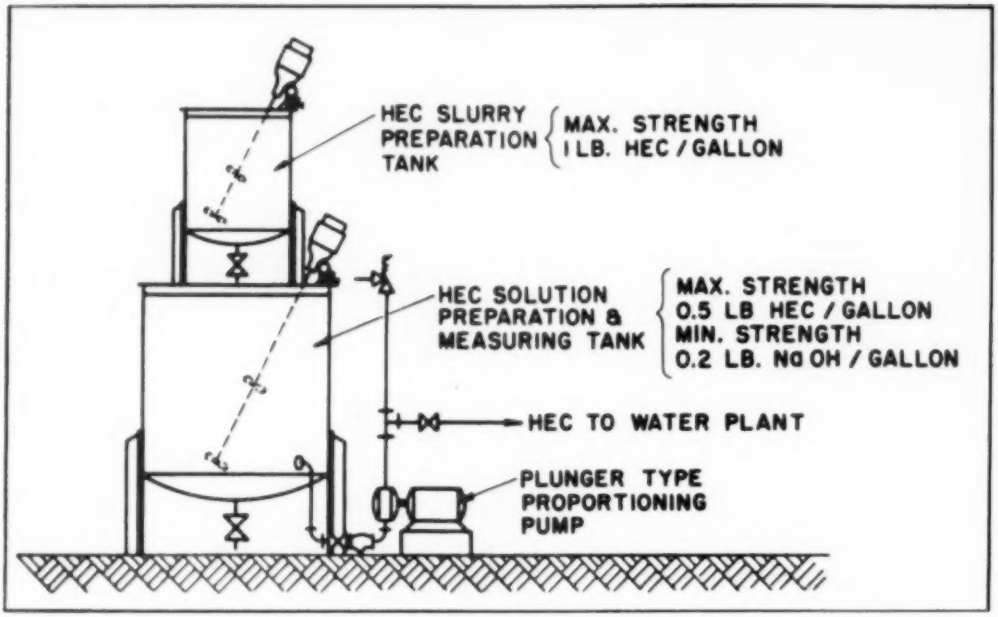


Fig. 1—Typical arrangement of HEC solution and feeding equipment.

A New Coagulation Aid

Experimental results with Hydroxyethel Cellulose indicates promising outlook for this agent as an economical coagulation aid.

by

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THE removal of suspended solids from turbid surface waters is normally accomplished by coagulation with aluminum or iron salts, separation of the resulting floc in a settling basin or suspended solids contact reactor, and final filtration of the clarified water through sand or anthracite. In this over-all process, proper coagulation is a critical factor in that it determines the efficiency of the mechanical operations of sedimentation and filtration.

Although coagulation of water has been practiced for many years, a review of the technical literature indicates that the number of theories explaining the mechanism of coagulation have multiplied with time[1, 2] rather than becoming integrated into a few simple laws[3]. As a result, the solution to successful coagulation is an individual problem to each water treatment plant. Likened to human behavior, there seems to be no norm in the behavior of water in a clarification plant.

Among the many variables to be considered in water coagulation are the alkalinity and pH value, temperature, the presence of color and organic pollution, and the nature of the suspended solids. These factors are subject to seasonal change, and in many cases the character of the raw water may change daily, requiring constant vigilance on the part of the plant operators. During the winter months in particular, successful coagulation is difficult, and the resultant floc is often fine and slow to settle, imposing an extra load on the filters because of inefficiency in the settling basin.

In the case of waters high in organic color, such as are found in heavily forested areas in the states of Wisconsin and Minnesota and the northern section of Canada, or in swamplands, successful coagulation is difficult even during the summer months.

For many years the water chemist has searched for a chemical reagent to improve the size and toughness of the aluminum hydroxide floc to solve some of the difficulties facing the operators of clarification plants. Various clays have been shown to be beneficial in some instances. Since 1931, activated silica has been investigated and its success is reported in the literature[10]. Because of the success of activated silica as an aid in improving the coagulation of difficult waters, particularly those having color or a high degree of organic pollution, it has been tried and is being used in many cases in plants which could coagulate successfully with alum alone. However, it is generally recognized that activated silica solutions are somewhat difficult to prepare, must be aged before use, etc. Nonetheless, it has

been used in these cases and results in reducing the alum demand and broadening the effective pH range so that operators are not required to control chemical dosages so closely as is necessary without the coagulant aid.

Introducing a New Coagulant Aid

A new coagulant aid, hydroxyethyl cellulose (HEC), has been investigated, and data are presented in this paper indicating its effectiveness. Data also are given comparing it to activated silica, the coagulant aid it most closely approaches functionally. HEC has been found to be very effective, both in the laboratory and in the plant, as a coagulant aid in the clarification of surface waters. Plant usage shows only about 1 ppm. of this compound is very effective. Solutions or dispersions may be easily prepared using simple equipment.

Hydroxyethyl cellulose (HEC) is a material long known to chemists, but whose use has not heretofore become widespread. The general properties and end-use pattern were recently reviewed[9]. It can be prepared by reacting ethylene oxide or ethylene chlorohydrin with alkali cellulose. The solubility of HEC is largely determined by the degree of substitution—that is, the number of hydroxyethyl groups per anhydroglucose unit. Products of degree of substitution over about 1.4 are water-soluble; those ranging from about 0.2 to 0.9 are soluble in caustic soda solution at room temperature. This paper is concerned only with the type of HEC having a substitution of about 0.3 to 0.4. Previously suggested end-uses are in the fields of filaments, sheets, and textile sizing and finishing, and as an adhesive for paper coating.

As a coagulant aid, HEC is readily dissolved in caustic soda solutions, and may be fed directly into the water as an alkaline dispersion or solution, forming a micelle in the water at pH values below about 9.0. Neither lime nor soda ash is a satisfactory alkali for dissolving HEC. Whenever the water supply is coagulated at a pH value below 9.0, neutralization of the HEC solution is unnecessary. Because formation of the micelle occurs in the water itself, there is no danger of gel formation in the feed tank or pipe lines.

The dosages of HEC found effective are low, and the concentrations permissible in the feed tanks are sufficiently high that even in large plants the equipment required for handling this reagent is of small size.

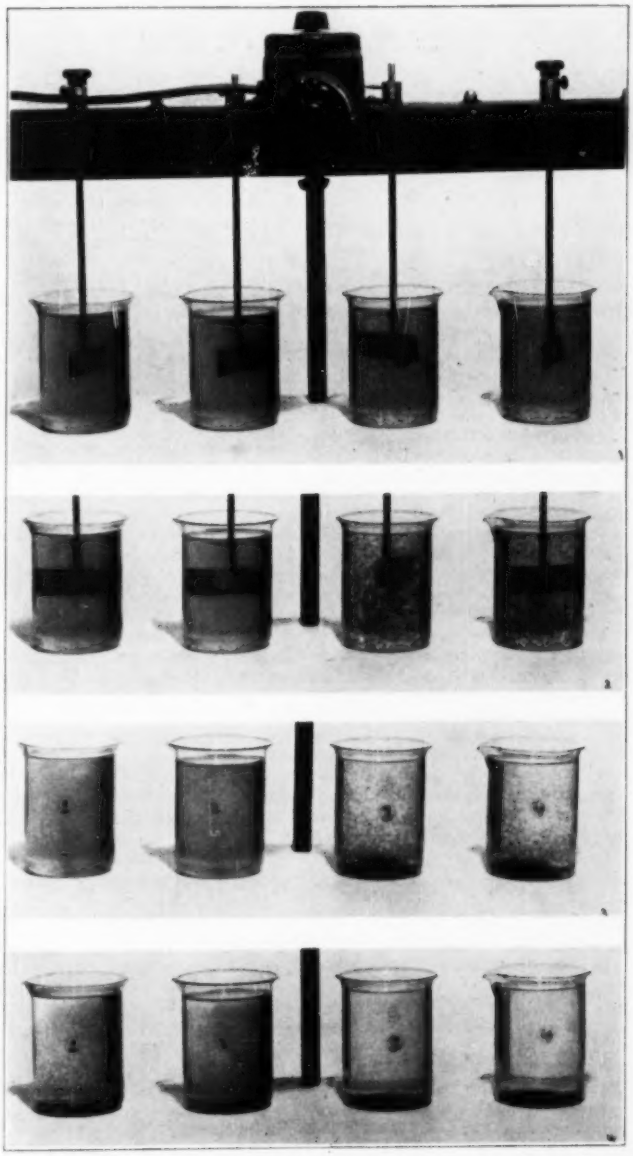

Fig. 2—Demonstrating effects of HEC in increasing floc size and speed of settling.

Beaker 1	*Beaker 2*	*Beaker 3*	*Beaker 4*
2 ppm HEC then 105 ppm Alum	*No HEC 105 ppm Alum*	*105 ppm Alum then 2 ppm HEC*	*105 ppm Alum then 1 ppm HEC*

PROGRESSIVE EFFECTS from top downward (1)—3 min. after addition of reagents; (2) 8 min. after addition of reagents; (3)—1 min. after stirring discontinued; (4) 10 min. after stirring discontinued. (See Table II—Supply G—for details.)

Solution Preparation

For use as a coagulant aid in water treatment, HEC is most conveniently prepared by the use of two batch tanks. HEC, a dry, fluffy solid, is slurried in water in an overhead tank, the maximum slurry strength being about 10%, depending on degree of agitation available. A flash mixer is normally used to prepare the slurry. The slurry is introduced by gravity into a second tank, holding caustic soda solution. This second tank is generally twice the volume of the

Table I

RESULTS OF JAR TESTING WITH HEC
Illustrating Its Effect on Rate of Floc Settling

Water Supply	Chemical Dosage in P.P.M. Alum	Parrisol	HEC	% of Floc Settled in 5'	15'	30'	60'
A	22.5	0	0	5	7	15	30
	22.5	0	0.5	10	30	65	80
	22.5	0	2	20	60	85	95
	22.5	0	4	60	90	95	99
A*	22.5	0	0	1	2	3	4
	22.5	0	0.5	5	15	20	35
	22.5	0	2	15	60	85	92
	22.5	0	4	80	90	93	95
B	15	0	0	4		20	50
	15	0	2	50		90	97
C	0	10	0	2		10	30
	0	10	1	6		55	82
	0	10	2	10		85	95

*Illustrates reproducibility, using a different sample of HEC from that used in Example 1.

overhead tank, and is half-filled with 4% (minimum strength) of caustic soda. After introduction of the HEC slurry into the caustic soda solution, the preparation will be 5% HEC and 2% NaOH. Thorough mixing is required during addition of HEC slurry to the caustic soda solution. Additional dilution, with stirring, can be effected if desired for more accurate feeding. Figure 1 illustrates typical equipment for feeding HEC, but various modifications are possible in the equipment setup.

The possibilities of HEC as a coagulant aid in water treatment were first investigated by the manufacturer, using various raw water supplies, aluminum and iron salts for coagulation, various dosages of HEC, and using HEC from a number of plant runs to check its reproducibility. Typical results are given in Table I. The data indicate that dosages of HEC as low as 0.5 ppm. are effective in improving the settling rate when either aluminum or iron salts are used for coagulation.

Plant Scale Results

The impressive results obtained in the laboratory so interested a number of clarification plant operators that they attempted plant trial runs. Prior to the plant trials, jar tests were performed on samples of the actual water supplies to determine the most effective dosages. These jar tests demonstrated that low dosages of HEC were effective in increasing the size and strength of alum floc, increasing the settling rate of the floc, widening the effective pH range for optimum coagulation and reducing the alum demand.

The effect of HEC in enlarging the size of the alum floc is typically illustrated in Figure 2.

In speeding the settling rate of alum floc, HEC proved effective in the coagulation of Delaware River water at a refinery near Philadelphia during plant trial runs.

Jar test data performed on this and other water supplies are shown in Table II to illustrate the reduction of alum dosage afforded by the use of HEC and also the effectiveness of coagulation at a higher pH value than possible without HEC. Interest in this observation lies in the possibility of eliminating pH correction after coagulation.

A utility in the east is currently using HEC treatment to improve coagulation in an upflow slurry blanket type plant. The aluminum sulfate dosage has been reduced from 110 ppm. to 30 ppm. by the use of 1 ppm. HEC, but the principal advantage of HEC treatment has been to stabilize plant operations under variable and unpredictable river water conditions.

At a Southwest utility, a turbid surface supply was being clarified in a suspended solids contact reactor plant, with dosages of about 85 ppm. alum supplemented with pre-chlorination and use of about 20 ppm. of clay. Because the surface supply was difficult to coagulate, the optimum pH value was about 4.8, so that soda ash was required as a supplementary feed to increase the pH value to about 6.5 in the clear-well. Satisfactory results were being obtained with this conventional treatment, but it was found that the use of 0.75 ppm. HEC per-

Table II

RESULTS OF JAR TESTING WITH HEC

Water Supply	Alum	Chemical Dosage in PPM Soda Ash	HEC	Silica	Other	Turbidity of Supernatant (PPM)	pH	Floc Character	Remarks
D	80	40	0	0	0	44	5.5	Fine	These data illustrate the results obtained by alum alone and alum aided by HEC and activated silica.
	80	30	6	0	0	7	5.5	Dense	
	80	40	0	10	0	8	5.5	Dense	
E	35	0	0	0	0	20	6.2	Med.	Illustration of chlorine as coagulant aid.
	35	0	0	0	1.5 Cl_2	8	5.7	Med.	
	35	0	0	0	1.5 Cl_2	8	5.7	Med.	Comparison of HEC with clay, using chlorine for oxidizing organic material.
	35	0	3	0	1.5 Cl_2	5	5.9	Dense	
	35	0	0	0	1.5 Cl_2 5 Clay "A"	28	6.2	Fine	
	35	0	0	0	1.5 Cl_2 5 Clay "B"	25	6.2	Fine	
	30	0	3	0	1.5 Cl_2	4	6.2	Dense	Reduction of alum and pH increase afforded by use of HEC.
	15	0	3	0	1.5 Cl_2	12	6.4	Dense	
	10	0	3	0	1.5 Cl_2	12	6.6	Dense	
	15	0	1	0	1.5 Cl_2	12	6.4	Dense	Illustrates effectiveness of lower HEC dosages as compared to higher dosages.
	15	0	1	0	1.5 Cl_2	9	6.3	Dense	
F	35	0	0	0	0	20	6.5	Fine	Illustrates effect of HEC in reducing turbidity.
	35	0	1	0	0	12	6.4	Dense	
	35	0	2	0	0	8	6.4	Dense	
	35	0	2	0	0	8	6.4	Dense	
	25	0	2	0	0	5	6.4	Dense	Illustrates reduction in alum dosage afforded by HEC.
	20	0	2	0	0	3	6.4	Dense	
	15	0	2	0	0	10	6.4	Dense	
G	105	0	2*	0	0	39	5.0	Fine	Color, 150
	105	0	0	0	0	28	5.0	Fine	Color, 100
	105	0	2	0	0	6	5.0	Dense	Color, 50
	105	0	1	0	0	18	5.0	Dense	Color, 75

*In this test, HEC was added before the alum; in other tests in this series, HEC was added after alum addition. Color of the original water was 260 ppm. See Fig. 2, illustrating the jar tests from which these data were obtained.

mitted an increase in the optimum pH value to about 6.4. This resulted in a reduction in alum to 40 ppm., and eliminated the need for soda ash addition at the clear-well. When the surface water is fairly turbid—over about 25 ppm. turbidity—the HEC permits elimination of clay, although when the turbidity is lower than this figure clay must be added.

This particular plant has a capacity of 143,000 gallons per hour, so that the reduction in alum dosage from 85 ppm. to 40 ppm. permits a saving of 1,300 pounds per day, valued at $21.00 per day delivered to the plant. Furthermore, the use of HEC provides an additional benefit and saving by eliminating corrective soda ash treatment and elevating the pH value in the reactor to permit protecting the equipment against corrosion.

At normal effective dosage, HEC treatment cost is usually less than 0.5 cents per 1000 gallons of treated water.

A manufacturing plant on the Delaware River normally coagulates river water with aluminum sulfate and clay. This normal treatment is ineffective when river conditions change due to storms and to organic pollution, and during such periods HEC is used to restore normal operation.

HEC has advanced beyond the stage of preliminary laboratory investigation and has proven of benefit in actual plant operation. As an aid to control of coagulation of turbid water supplies, it shows much promise. Its cost is economical in the low dosages normally required. In addition to its economic benefits in reducing alum consumption and permitting coagulation at higher pH values, it provides the following benefits:

(1) Allows less close control so that unskilled operators may be used.

(2) Guards against carryover of turbidity from settling basins when handling surface supplies of fluctuating quality.

(3) Extends water treatment capacity with existing equipment.

(4) Reduces by-product sulfates in amounts equivalent to the alum reduction.

Data are being compiled on the benefit of HEC treatment to lime softening plants, both hot and cold. Its properties also suggest its use in filtration of oily condensate, or iron-bearing daters.

Current work indicates that the feeding of HEC as other than a caustic solution is practical and effective, and data are being collected on such techniques.

The writers acknowledge the able assistance of Romayne Parks, Cochrane Corp. and W. E. Gloor, R. M. Brooks, W. J. Fullen, Hercules Powder Co., in the preparation of data and for their pertinent comments.

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(2) Hoak, Richard D. "Water & Sewage Coagulation: Colloidal Chemical Background" A.C.S. Paper delivered before Division of Water, Sewage and Sanitation Chemistry, Detroit, April 1950.
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Tom Veatch Named "Man-of-the Month"

N. T. Veatch, Jr., better known to his host of friends as "Tom," has been elected "Man-of-the-Month" in Kansas City.

The "Man-of-the-Month" club in Kansas City was originally sponsored by the WHB Broadcasting Co. This six year old organization now rates as a civic-honor society and to be elected to membership by this group of civic leaders is an outstanding honor in K.C. The rules limit new members to not more than six in any one year, so we are told by "Don" Davis, president of WHB Broadcasting Co. and editor of the company's magazine "Swing."

"Tom" Veatch is already well known to most of our readers as president of Black & Veatch Engineers of Kansas City and recently president of the Am. Water Works Association. He is a Rotarian, a member of four K.C. clubs, four honorary societies and engineering fraternities; a Shriner, bank director and a member of every professional engineering society that counts for anything. Lately he has been appointed a member of the Federal Water Pollution Control Advisory Board.

We could say more, but we've run out of space.

National Sanitation Foundation to Study Toxicity of Plastic Pipe

Proof that plastic pipe and hose is non-toxic and has the chemical stability to be used in water supply mains on farms and in rural communities is to be sought in a research project that will be undertaken during 1952 in Ann Arbor, Michigan.

Executives of 10 national firms specializing in the manufacture of extruded plastic products, and the eight firms which supply them with raw plastic materials, asked the National Sanitation Foundation in Ann Arbor to undertake the research which will be jointly supported by their companies.

Because recently developed thermo plastic pipe gives considerable promise of being widely used in water systems in the future, the plastic industry representatives sought out the Foundation to get a reliable and impartial test of their products that may be distributed later to public health officials throughout the country.

The National Sanitation Foundation, headquartered at the University of Michigan School of Public Health, was established seven years ago by industrial and public health leaders to act as a non-profit agency which could solve mutual sanitation problems through research, mutual understanding and educational programs. Dr. Henry F. Vaughan, Dean of the School of Public Health, is president of the Foundation. Walter F. Snyder, former Toledo public health officer now located in Ann Arbor, is its executive director.

California Needs Water Pollution Control Engineers

California's new water pollution control program, created by legislation in 1949, has made significant progress in the last 18 months, Vinton W. Bacon, executive officer, reports.

The nine regional boards received 478 reports on proposed waste discharges in that period, prescribed requirements in 327 of these cases, and investigated 1,173 sources of pollution or nuisance.

The organization still needs competent water pollution control engineers, and will receive applications up to March 15, 1952. Information is available from the California State Personnel Board, 1015 L Street, Sacramento, California.

Worry is like a tread-mill—it can wear you to a frazzle, and you still haven't got anywhere.

Basic Factors
In Centrifugal Pump Application

Part 6—Determining Pump Delivery on Its System

by ROY CARTER *and* IGOR J. KARASSIK
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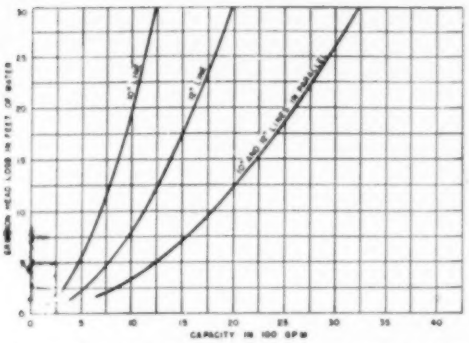


Fig. 37—Method of calculating the capacity vs. friction head for two pipe lines in parallel.

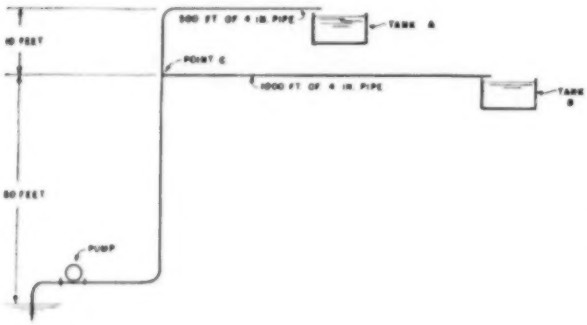


Fig. 38—Diagrammatic layout of system with two branches and uncontrolled flow (above) and

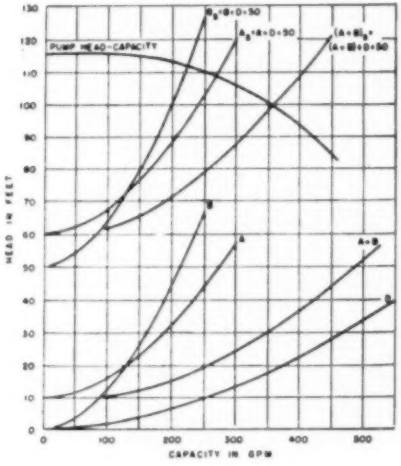


Fig. 39—Solution of problem presented in Figure 38.

VERY often in the case of plant or community located some distance from its source of water supply, the demand for water increases over a period of time and it becomes uneconomical, because of the frictional head loss with increased load, to continue to use the existing pipe line. If the original line is in good condition, the usual solution is to install a second line of a size that, in parallel with the existing line, will make for economical pumpage of the desired increase in the rates of pumpage. In such cases of two pipes operating in parallel, the flow thru each line must be such that the friction head loss is the same for each. The proper approach to this problem is to plot the capacity vs friction head loss for each line and then get the combined capacity vs friction head loss for the two by adding together the capacity of each line at a number of points of equal head losses. For example, on Figure 37 there is indicated the head loss for a 10″ line and the head loss for a parallel 12″ line. With a 20 ft. friction head loss, the 10″ line will have a flow of 1000 GPM while for the same loss in the 12″ line the flow will be 1615 GPM. Thus 1000+1615=(2615 GPM) will be the combined flow of the two lines with a head loss of 20 feet. Similarly the capacity for the two lines in parallel for equal head losses can be determined for a number of points and a curve showing combined capacity vs head loss can be drawn, as is also shown in Figure 37.

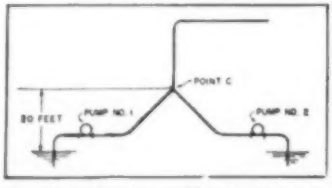


Fig. 40—A pumping problem involving two pumps, each with considerable individual piping discharging into a common line.

In some systems, like a water works distribution system, it is desired to maintain a nearly constant pressure altho the demand varies. To maintain an exactly constant pressure it would be necessary to vary the speed of the pump or pumps. It is rarely necessary to maintain the pressure exactly and some variation can be allowed. Most electric motor driven pumps for this service are therefore driven by constant speed electric motors with the result that the pressure will be dependent upon the head developed by the pump or pumps operating in parallel at the demand capacity. To produce a reasonable constant pressure for the

*The sixth article of a series dealing with basic considerations in the application, selection and operation of centrifugal pumps. Earlier articles of the series appeared in issues of Jan., Feb., May, Aug. and Oct. 1951.

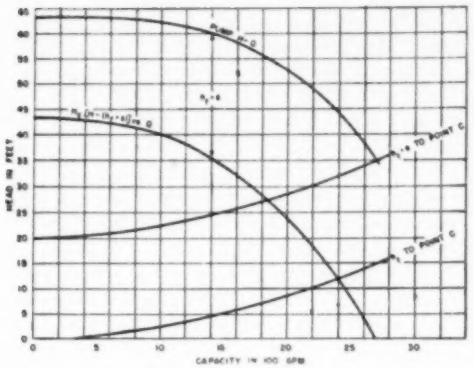


Fig. 41—Problems, as presented in Fig. 40, are solved by determining head available at common point.

full range of demand, pumps with head-capacity curves which have a shut off head 10 to 20% more in excess of the head at design capacity are desired for such services.

Installation of divided flow or branch lines where the flow is not controlled, except to prevent overflowing of a tank or reservoir, usually involve two or possibly three branches. In case of the installation shown in Figure 38, it is obvious that no flow will go to tank A unless the friction head loss in the 4" line from C to tank B exceeds 10', the difference in static head for the two inlets. Considering branch B alone from point C, the system head has no static component and will be frictional head only. This is calculated and appears as curve B in Figure 39. The system head for branch A alone from point C has a 10 ft. static head component plus the friction in 500 feet of 4" line and works out to be curve A in Figure 39. The capacities for the two branches for equal system heads at point C can then be added together to give the system head of the two branches as a unit, which gives us curve A and B on Figure 39. As the friction loss in the piping from the supply to point C is common to both branches there would be no difficulty in establishing the friction head curve. This appears as curve D. As point C is 50 feet above the suction supply, the system head for the common system up to point C would be the friction head plus 50 feet. Adding to these head values, the head values on curve (A and B) we get our system head curve for the system, (A and B)$_s$ on Figure 39. If the pump used for this service had the head-capacity characteristic H-Q on Figure 39, the resulting total flow would have been 358 GPM. Projecting down to curve (A and B) it would be seen that this capacity would have required a head at C of 31 feet. Projecting over to curves A and B would indicate 193 GPM would be going to tank A and 165 GPM to tank B.

If the two branches to the tanks had been equipped with valves actuated by some control so that they close when their respective tanks become full, there would be cases where the flow would be to either one of the tanks. The flow to tank A if the branch to tank B is shut off can be determined by constructing its system head cure A_s (by adding head values on curves A and D plus the 50' static head) and seeing where this curve A_s intersects the H-Q curve of the pump. Likewise B_s can be constructed to show what the flow to tank B would be if branch to tank A is shut off.

Had it been contemplated to use a pump which developed 61½ feet or less total head at 90 GPM capacity, the entire flow would have gone to tank B.

In many cases, especially those involving two or more pumps each with its own piping, valves, and fittings discharging into a common discharge line, the solution of a problem can be simplfied by determining the head each pump will produce for its range in capacity at the point in the system where the piping becomes common. For example in the system shown diagrammatically in Figure 40, the usual head capacity of pump #1 is shown on Figure 41. The friction loss from suction supply to point C is plotted (see Curve H_f, Figure 41) and the system head (curve H_f + S, Figure 41,) for pump 1 from the suction supply to point C is thus determined. Subtracting the values on curve h_f + S from those on the H-Q curve of the pump, we get curve H_e indicating the head that will be produced by pump #1 at point C depending upon the capacity it is delivering.

Two Types of Pumping Systems

Pumping systems can be of two types. The first is one in which the capacity is determined primarily by the demand, such as in water works distribution systems or in a boiler feed installation, with the flow being controlled by throttling which uses up any head developed by the pump over that required. The second is one in which the flow is not throttled and the flow is that at which the head developed by the pumping equipment equals the head required to deliver that quantity thru the system. For pumps to be operated in parallel on a throttled system, it is generally desirable that they have similar head capacity characteristics of the stable or rising type, in which only one capacity is delivered at any head from O to shut-off. Such characteristics are those shown in Figures 44 and 47. As mentioned above the increase in head from design capacity to shut-off should not be too high, as otherwise excessive pressure is developed at part capacity flows. In a system in which it is desired to maintain a constant minimum pressure at the pumping plant with varying demand, it is usual to have the design head of all the units the same and to have the shut-off heads of all units the same or approximately so. Thus, in case of flows less than the units in service will produce at rated head, the capacity delivered by each pump will be about the same percentage of the rated capacity. For example, in Figure 42 involving 2500 (pump A) and 5000 (pump B) GPM

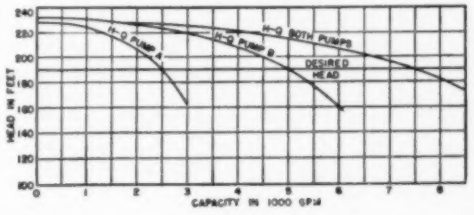


Fig. 42—Head capacity characteristic determination for two pumps in parallel.

pumps operating in parallel, if the demand was 5500 GPM, the head developed by the two pumps would be 211 feet (21 feet over that desired) and the capacity being delivered by pump A, would be 1800 GPM or 72% of rated while that being delivered by Pump B would be 3700 GPM or 74% or rated.

There are some throttled systems in which there is a long transmission line between the pumping station and the point at which a minimum pressure is to be maintained. In such cases, the reduction in pipe friction in the line with reduced flow will cause increased pressure at such reduced flow. Where this increased pressure is objectionable, the possible solution might be (1) throttling the excess head by some form of valve to keep a constant pressure (2) varying the speed of the pumps so that the required head is developed at the capacity demand (3) using one or more booster pumps in series with the pumps operating in parallel so the head developed by the pumps in service can be increased in steps as the capacity demand increases or (4) use of a number of pumps so that small increments of capacity can be obtained. In general in such cases the proper solution is that which is best economically and

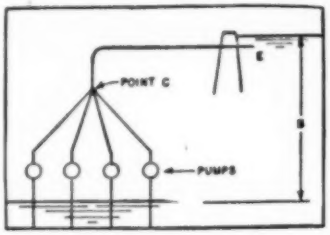
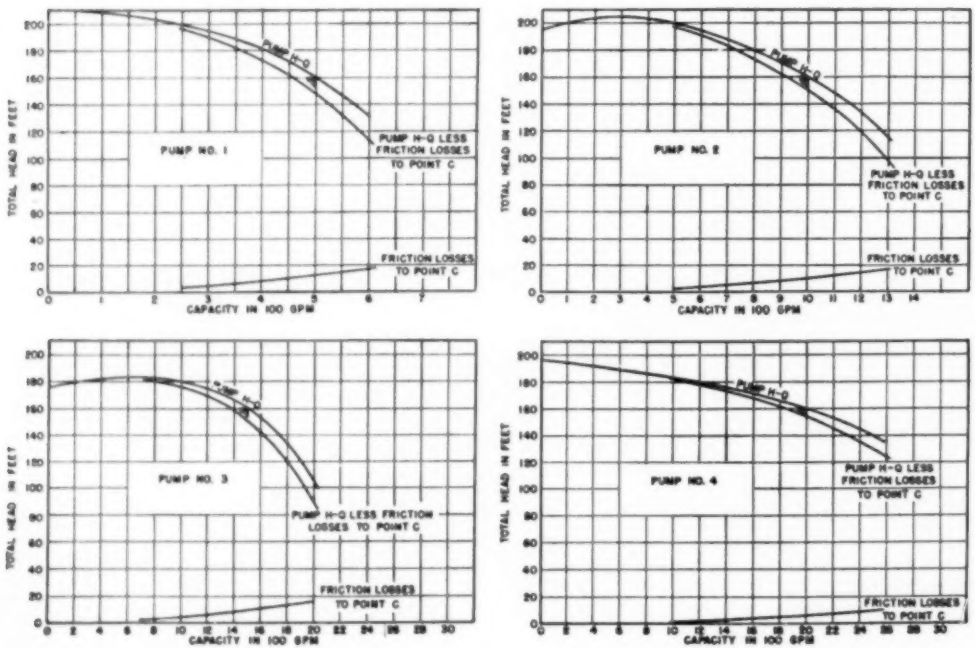


Fig. 43—Diagrammatic layout of a common problem, involving pumps with some individual piping discharging against a static head thru a common discharge line.

is therefore dependent in part upon the cost of power as well as the cost of personnel necessary for operation.

In the case of the second type of system in which the flow is not throttled and in which the capacity is that at which the head developed by the pumping system equals the head necessary to deliver that capacity thru the system, pumps do not have to have similar characteristics in order to be operated in parallel. When buying additional pumps to operate in such a system, many purchasers make the mistake of requiring the additional pumps to have exactly similar characteristics to their existing units when it is not necessary. For the system shown diagrammatically in Figure 43, the system head beyond Point C is indicated in Figure 48. The desired pumpage is from a 2500 to 5000 GPM rate. The four pumps whose characteristics are shown in Figures 44, 45, 46, and 47, are not similar but as the maximum head against which they will operate is 160 feet, all can be operated in parallel on this system. (Note the H-Q curves plotted on Figure 48 in combination with the other pumps have individual piping and fitting losses deducted.)

For systems like that just discussed, the most economical pump operation will be obtained when there is little variation in the system head as the capacity changes. In many installations the friction head is so large a component of the total head at maximum capacity, that pumps designed for specific capacities and heads are better in the long run than pumps in parallel which would operate at poor efficiency at other than designed head. For example, for the system whose system characteristics is shown on Figure 49 and in which a flow of 6250 to 10400 GPM is wanted, three separate pumps designed for 6250 GPM at 139 feet THd, 8530 GPM at 166


PUMP NO. 1
PUMP H-Q
PUMP H-Q LESS FRICTION LOSSES TO POINT C
FRICTION LOSSES TO POINT C
TOTAL HEAD IN FEET
CAPACITY IN 100 GPM
PUMP NO. 2
PUMP H-Q
PUMP H-Q LESS FRICTION LOSSES TO POINT C
FRICTION LOSSES TO POINT C
TOTAL HEAD IN FEET
CAPACITY IN 100 GPM
PUMP NO. 3
PUMP H-Q
PUMP H-Q LESS FRICTION LOSSES TO POINT C
FRICTION LOSSES TO POINT C
TOTAL HEAD IN FEET
CAPACITY IN 100 GPM
PUMP NO. 4
PUMP H-Q
PUMP H-Q LESS FRICTION LOSSES TO POINT C
FRICTION LOSSES TO POINT C
TOTAL HEAD IN FEET
CAPACITY IN 100 GPM

Figs. 44-47—Head-capacity characteristics of 4 pumps for system in Figure 43, also showing head-capacity with losses to C deducted.

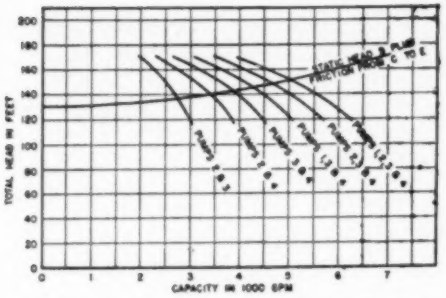


Fig. 48—System head and head-capacity curves of various combinations of pumps shown in Figs. 44 to 47.

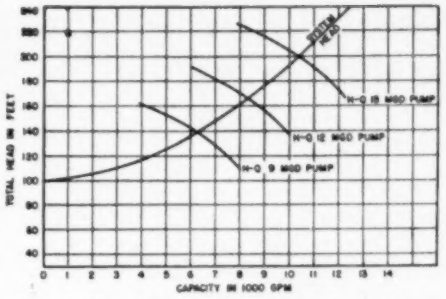


Fig. 49—When frictional component at maximum rated capacity is nearly same as static head, separate pumps spanning the capacity range desired are necessary for maximum economy.

feet THd and 10400 GPM at 200 feet THd might be the proper solution. In other cases where the head is practically all friction the solution may be a full capacity pump driven by a two or three speed motor. Figure 50 illustrates the characteristics of a pump driven by a two speed (1200 and 900 RPM) motor operating against a system head which is entirely friction. When operated at the lower speed the resulting capacity would be approximately ¾, while the pump efficiency remains practically the same. When pumps are driven by multi-speed motors, the capacities which can be obtained at lower speeds are dependent upon the speeds available so it is not always feasible to obtain the exact capacities desired. To obtain exact capacities a variable speed driver would have to be used.

Another possibility which is used considerably to increase the capacity of existing stations, is to install one or more booster pumps, either in the suction line to the main pumps, or in the common discharge line. For example, for the system illustrated in Figures 43 to 48, if conditions should change so the maximum demand at times will be 5900 GPM, one solution would be to have all four pumps discharge into a 5900 GPM 30 feet total head booster pump. Booster pumps are especially practical when the increase in head will cause considerable reduction in capacity of the main pumps.

The discussions in this article, while of a general nature, have used systems handling water as illustrations as that is the liquid most commonly used. The basic principles apply to systems handling other liquids as well. In some cases of liquids other than water, there are certain limitations, such as minimum pressures that must be maintained at any point in a system as when handling volatile liquids, which must also be checked when analyzing the system. Then too, it must be remembered that pumps with high specific speed impeller designs have steeper curves than pumps with low specific speed designs. Thus, in systems involving low heads for which a high specific speed type of pump will be used, a greater variation in percentage of total head can be met efficiently than in systems involving high heads for which a low specific speed pump must be used. Occasionally, some low head system will require the use of a low speed type of pump in order to accomplish the desired operation.

There are a few systems in which there is a wide variation in head range with no fixed capacity being required at any specific head. Such a system occurs in dewatering a flooded mine. This is unlike most applications of centrifugal pumps, in that the total head against which the pump must work varies from approximately zero to a high maximum which occurs when the mine is almost clear of water.

A mine dewatering pump should be designed not for a single point of head and capacity, but rather, for the greatest possible capacity at all heads within the capacity of the motor. For installations involving final heads requiring multi-stage pumps, the best possible design is a "parallel-series" unit, with which the dewatering takes place almost twice as fast at the beginning as if the various stages were arranged to pump only in series, and yet, with the expenditure of the same power. Figure 51 shows the characteristics obtained in a special series—parallel mine pump.

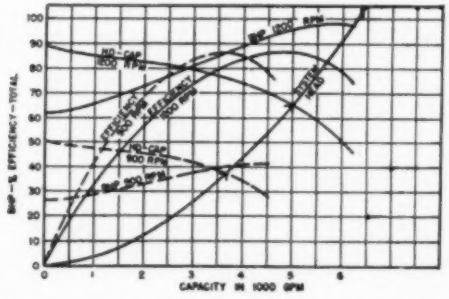


Fig. 50—Results obtainable with two-speed motor driven pump on a system which has entirely frictional head.

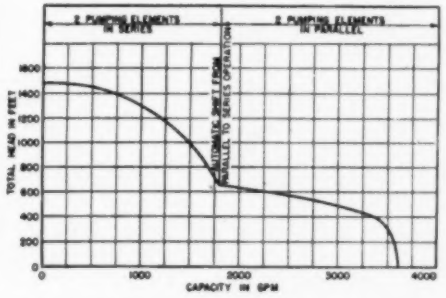

2 PUMPING ELEMENTS IN SERIES
2 PUMPING ELEMENTS IN PARALLEL
AUTOMATIC SHIFT FROM PARALLEL TO SERIES OPERATION
TOTAL HEAD IN FEET
CAPACITY IN GPM

Fig. 51—Head-capacity characteristics of a series—parallel mine pump where maximum capacity is desired at all heads.

New Water Works for Pax, W. Va.,

Plastic Pipe Proves Problem Solver

by DENNIS M. LEARY, Jr.,
Consulting Engr., Beckley, W. Va.

FOR nearly a half century, Pax has been without a central source of water. Water for home use was drawn or pumped from individually-owned wells and springs. The high iron and sulphur content of this source left much to be desired in drinkability.

Biggest overshadowing menace, however, was the lack of a reserve water supply to fight fires. Including the adjacent unincorporated villages of Long Branch and Wierwood, the community comprises a total of 374 homes. The population is approximately 1,400.

Several factors, mostly geological, have prevented a water improvement program in the past. Pax is situated in the Paint Creek Valley—a small basin among steep hills—between Beckley and Charleston, W. Va. Even to survey this choppy topography was considered an expensive, time-consuming undertaking. It was believed that a trenching pattern suitable for serving the community's water needs would resemble a maze puzzle. Money, too, was a big question, because of the small population.

Furthermore, the acid-producing shale formation around Pax "eats up" ordinary metal pipe in about three years.

A few years ago, the Pax Pure Water Co., a private concern, bought a well in Long Branch, one mile west of Pax, installed a filter and pumping station, and made a new source of pure water available to about 40 homes.

Mayor Frank Wriston and the Pax City Council asked the writer to investigate Pax' water potential and submit a report on the possibilities and estimated cost of a new waterworks.

After one good look at the landscape the feasibility of making a ground survey was immediately dismissed. In less than a week, an aerial photograph of the area was obtained. From it the new water system could be plotted quickly and accurately.

The report to the Pax City Council, recommended that the city buy the existing 6-inch cased well, filter plant and pumping station—an adequate ground water source. It was also stated that with another well pump and another distribution pump, the existing Long Branch well would serve the community. Following slight renovations of existing facilities, the only new extensions necessary were 33,130 lineal feet of new pipelines, 10 fireplugs and a 100,000-gallon storage tank on a hill north of the town.

Plastic Pipe Chosen

In view of the rugged terrain and corrosive soil it was decided to employ a flexible plastic pipe and fittings for most of the distribution network.

Revenue bonds for the $130,000 project were signed in July, 1951. Construction started in August. The

EASY GOING along this stretch where little or no rock was encountered.

FLEXIBILITY of the two-inch plastic pipe demonstrated by the author.

new waterworks was completed by November 1, 1951.

The installation was completed in less time, and at less cost, than the most conservative previous estimates. Plastic pipe proved an important time-saver. Extremely flexible, this new type of pipe could be swung around boulders, stumps and other obstructions. Its light weight facilitated "snaking" it out and laying it in trenches. Plastic pipe could be jointed to metal or plastic, either threaded or cemented.

Needless to say, Pax residents—after waiting 50 years—are mighty happy to have an adequate domestic water supply and fire protection source.

Whitney & Cunningham, Charleston, W. Va., were the contractors and the plastic pipe and tubing was supplied by The Yardley Plastics Co., of Columbus, Ohio.

Mono- and Dichloramine Determination in Water

A Reply and Some Comments

by A. T. PALIN, *Chief Chemist, Newcastle and Gateshead Water Co., Newcastle on Tyne, England.*

The writer's foremost desire is to place on record his sincere appreciation of the excellent and timely survey of the amperometric and Palin methods for chlorine and chloramine estimation presented by D. B. Williams in this journal, October 1951. The account of independent experience with the Palin method has, of course, been read with particular interest.

It is not surprising, nor unusual, to find that continued experience with a new analytical technique reveals a need for further refinement. One could point, for instance, to the "acid o-tolidine" test which has been modified by various workers over the years; and, again, to the amperometric method which although announced some nine years ago has only recently undergone considerable development. So far as the Palin method is concerned, the comments now made by Williams will undoubtedly go a long way towards assisting its further improvement and development.

Possibly, at this stage, it is desirable to recall that an improved version of the method is already in existence having been presented to the [Br.] Institution of Water Engineers in April 1950, subsequently to appear in their journal (1950, *iv*, 579.). Of this there is no mention in Williams' paper (except by way of a brief footnote) and it is not beyond the bounds of possibility that the inclusion of the improved method in the present investigation might well have met some of the criticisms made of the earlier method.

Further information about the Palin method and its adaptation to photometric measurement may be obtained from a paper by Aitken and Mercer (Jour. Inst. Water Engs. 1951. *v*. 321.). In further development work, as yet unpublished, it has been found possible to stabilize the neutral o-tolidine colour at temperatures above those normally encountered.

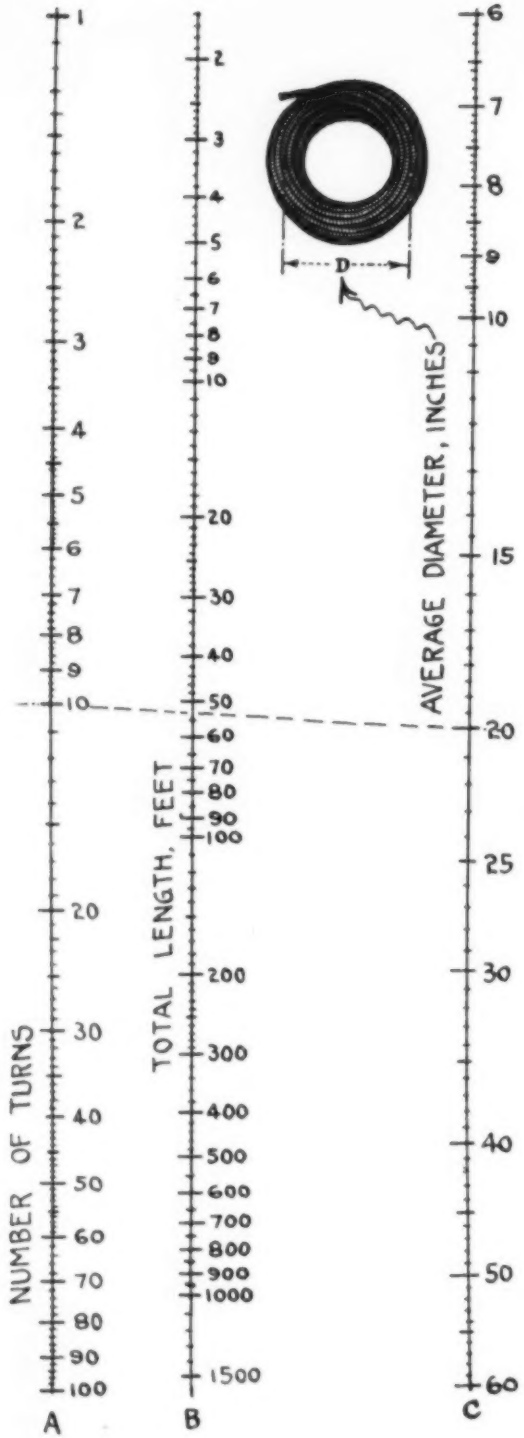
The statement made by Williams that the writer "did not realize that the early work of Marks and Glass had resulted in the Wallace and Tiernan Amperometric Titrator with its improved technique" cannot be passed without comment. The 1948 papers of Marks et al. dealing with residual chlorine in sewage had, of course, been noted. The writer must admit, however, to having been unaware of any suggestion, up to that time, as to the inapplicability of the original amperometric method to water testing, and can only plead, by way of excuse, that neither was it known to representatives of the Wallace and Tiernan Co. who demonstrated the apparatus at a meeting of the Sterilization Research Group of the [Br.] Institution of Water Engineers in February 1949. With the Palin method then available the failure of the amperometric titrator to respond to dichloramine became evident in comparative tests. The assumption that these findings were not unconnected with the appearance some two years later of a modified amperometric method appeared reasonable.

Reports of other workers, both in this country and in America, who have used the ferrous ammonium sulphate titration procedure have been rather more encouraging and several have pointed to the basic similarity of the modified amperometric and the Palin methods, the essential difference lying in the means adopted for determining titration end-points. That the latter method, unlike the amperometric method, can form the basis of a simple colorimetric test more suited to the routine requirements of waterworks operators should not, however, be overlooked.

One of the more disconcerting results of recent researches is the discovery that nitrogen trichloride (NCl_3) can sometimes be a source of trouble in free-residual chlorination. This nuisance is mentioned by Williams, but it would seem somewhat illogical to suggest, following the painstaking development of precise methods for the estimation of chlorine and the chloramines, that it is sufficient to rely upon the nose for NCl_3! For the estimation of this constituent the extraction procedure is surely not so very difficult. Nothing more is required than the extraction, say of 120 ml. of sample by shaking with 12 ml. of CCl_4 in a stoppered bottle and, after standing to allow separation, decanting 100 ml. of sample for titration. Undoubtedly in this procedure there is still scope for further improvement and in regard to residual chlorine determination generally the writer would be the last to assume that the final word on the subject has been said.

There can be no surer way to progress, however, than the regular interchange of ideas and information and the perusal of the present article by Williams has been most instructive.

"My teacher says you are a back number if you think that water is just plain H_2O like you told me it was."



DETERMINING LENGTH OF COILS

(A Useful Nomograph*)

Anyone who handles wire cable, rope, hose, etc., will find the accompanying chart useful for finding the length in feet of anything that is rolled up, such as coiled copper or plastic tubing, lead pipe, hose, rope, cable, wire, etc.

All that is necessary is to count the number of turns in the coil, and measure the "average" diameter as shown on the chart. Then lay a straight-edge across the chart, as indicated by the dotted line drawn in the sketch, and the answer is immediately found in column B. The figure may, of course, not be exact, but will serve in many instances where it is not necessary to be exact.

For example: To find how many feet in a rolled-up cable whose average diameter is 20 in., and in which there are 10 turns, connect the 10 in Column A with the 20 in Column C as the dotted line shows, and the intersection with the middle Column will give the answer—53 feet approximately.

The chart can be used "backward" as well. For instance, if it is desired to take along about 300 feet of a coiled up article and the workman wants to know how many turns to take, a straight-edge laid across 300 on the middle scale will tell how large the coil should be made and the number of turns required in order to contain the desired length.

Ed. Note: The author advises that, by test, the difference between actual and computed lengths in 50 to 100 ft. coils should be no more than 5 to 6 per cent.

*Contributed by W. F. Schaphorst, M.E., Newark, N.J.

St. Paul Host to Federation

Concluding Installment of Report on 24th Annual Meeting

by HARRY A. FABER, *Associate Editor, and* GEORGE E. SYMONS,* *Contributing Editor, Water and Sewage Works, New York City*

THE first report on the annual meeting of the Federation of Sewage and Industrial Waste Associations in St. Paul, October 8-11, was published in the December 1951 issue of *Water & Sewage Works*. This installment reports the concluding sessions of the meeting.

Federation President Ralph E. Fuhrman presided at the Wednesday morning session. The three technical papers presented related to sewer system records, industrial waste treatment instrumentation, and the determination of charges for industrial wastes. "A Tale of the Twin Cities," the motion picture which documents the development and operation of the Minneapolis-St. Paul Sanitary District, was shown at this session.

A Story of Sewer Records

"SEWER SYSTEM RECORD KEEPING" by K. B. Stallings, Plans Engineer, Nashville, Tennesee.

Restricting his discussion to experience in the City of Nashville, Mr. Stallings presented a humorous case-history of one municipality's struggle to enlarge and preserve its knowledge of sewer locations. Sadly he admited that past generations of engineers were construction men, far more concerned with immediate achievement than with keeping records.

The earliest plans of Nashville sewers, 80 to 100 years old, give details of square masonary structures which follow the meanderings of existing ditches. Drawings were first prepared on "egg-shell" paper, and this practice was succeeded by the "roll era." In the "roll era," cloth backed cross-section paper in rolls 10-20 yards long were used—and seldom was a roll ever cut! Early records, detailed in 1800 field books of conventional size, are now the only source of survey information; the interpretation of these presents many difficulties.

Modern practice is based on the use of standard 24 x 36 inch sheets, and linen and ink are employed because the sheets are for record purposes rather than construction. Special attention is given to indexing. Lantern slides were used to illustrate the present use of block maps; these are on a 400 scale and, by means of a key map, can be utilized by planning and zoning officials. Future improvements will include a more comprehensive card index system giving complete data on every sewer.

In discussing this paper, Mr. Lloyd Dr. Knapp, City Engineer, Dept. of Public Works, Milwaukee, Wis., considered his city to be fortunate in having reasonably accurate plans for all sewers. All plans were redrawn on tracing cloth as a WPA project. In Milwaukee, a Kardex system is used to index every street in the sewer system.

For general reference, a set of wall maps on a scale of 300 feet to the inch is provided. Each sewer maintenance yard also has a set and finds the maps invaluable for reference. Two sewer examining crews (a foreman and two men in each) carry on special and routine jobs: their reports of findings go to the design division. In addition, construction and operating records prove of great value.

Instrumenting Waste Treatment

"INSTRUMENTS AND THEIR APPLICATION IN THE CONTROL OF INDUSTRIAL WASTE TREATMENT" by W. N. Greer, Leeds and Northrup Co., Philadelphia, Pa.

Lloyd D. Knapp
City Engr.
Milwaukee, Wis.

K. B. Stallings
Plans Engr.
Nashville, Tenn.

Program Participants

W. N. Greer
Leeds & Northrup
Phila., Pa.

Thos. M. Niles
Greeley & Hansen
Chicago

Geo. Schroepfer
Univ. Minnesota
Minneapolis, Minn.

Mr. Greer emphasized the desirability of employing instruments to make preliminary investigations of plant design and plant operation. Sampling of industrial wastes should be on a continuous rather than intermittent basis. The most widely applicable device is the pH meter, since retention capacity and chemical ventralization are widely employed to control the uniformity of industrial wastes. The applications in which oxidation-reduction potential meters and conductivity meters are of value were also described.

A discussion of this paper was prepared by Mr. Isadore Nusbaum, Supervising Sanitary Chemist, Sewage Treatment Plant, Detroit, Mich., and was read by Dr. Gail P. Edwards, Prof. of Public Health Engineering, New York University, N.Y.

Mr. Nausbaum cited the limited variety of instruments available

*Consultant and Technical Editor, Larchmont, N.Y.

for continuous control operations. Oxidation-reduction instruments are particularly prone to "poisoning," and the segregation and protection of sampling points is of special importance. In general, instruments should be recognized as valuable—but far from foolproof—tools.

Fair Charges for Wastes

"Determination of Fair Charges for Industrial Wastes" by George J. Schroepfer, Professor of Sanitary Engineering, University of Minnesota, Minneapolis, Minn.

A most comprehensive paper was presented by Prof. Schroepfer—when published, this will provide a valuable source of reference material. The methods of determining charges include ad valorem, special assessments, and specific rate charges (the second method is employed by about 80 per cent of municipalities).

Charges may be fairly determined by the proper allocation of costs between domestic and industrial users of the sewer system and the sewage treatment plant. Quantity of flow and the treatment plant units should be considered in establishing treatment costs. Examples were used to illustrate practical applications of such methods. Special considerations (variable peak flows, etc.) must be recognized, and periodic review of cost allocation should be made every 3 to 10 years.

Mr. Thomas M. Niles, Partner, Greely and Hansen, Consulting Engineers, Chicago, Ill., in discussing this paper emphasized the need for special studies in applying any system of industrial waste charges to a particular municipality. He illustrated the wide range of charges typical of different methods of establishing rates.

Air and Water Pollution

"The Interrelationship Between Air Pollution and Water Pollution" by Louis C. McCabe, Chief, Fuels and Explosives Div., Bureau of Mines, U. S. Dept. of the Interior, Washington, D. C.

This paper was presented by Sidney Gottlieb, Assistant to Mr. McCabe. Particularly disturbing is the interrelationship which is typical of the mineral industry (which has a volume of production, in the U.S., two times that existing before world War II.) Wastes from industries now create a problem more serious than those from municipalities, and a large proportion of the problem results from mineral industry wastes.

Air pollution problems have become so evident that present considerations almost state: "You can't put the waste in water and you can't put it in the air." The best solution is generally waste prevention. The cost of air pollution from smoke runs into millions of dollars per year, and preventive measures (elimination or removal from air) are not only costly but usually involve water disposal methods ultimately. Only recently has air pollution received adequate attention; the solution of this pollution problem is necessary to protect health and property.

The paper was discussed by M. Allen Pond, Chief, Div. of Engineering Resources, U. S. Public Health Service, Washington, D. C., and E. Neil Helmers, Eng'ring Service Div., E. I. duPont de Nemours and Co., Inc., Wilmington, Del.

Mr. Pond described the pollution of water and of atmosphere as interrelated, with no established standards applying to the latter. Long term studies are required to determine the effect of trace elements and of radio isotopes as contaminants. Evidently, more varied agencies must be involved in future research. State and local authorities must move rapidly toward solving problems, or control by the Federal government may become necessary.

Mr. Helmers emphasized the similarity in philosophy and procedure which is evident in control of both air and water pollution. A basic approach must include definition of the problem; establishment of a plan of action (legal aspects involved in air pollution are largely local rather than state); and, finally, devising an engineering approach to solving the problem. Especially in the chemical industry, savings in water (hence, reduction in stream pollution) generally result in more wastes to be treated by incineration (and, thus, an increase in potential air pollution).

INDUSTRIAL WASTES FORUM

Prof. Rolf Eliassen—Leader

One of the most heavily attended sessions of the conference was that held on the closing day which comprised a Forum on Industrial Wastes dealing with "The Application of Unit Processes in Industrial Waste Treatment." As leader of the Forum Prof. Rolf Eliassen of the Mass. Institute of Technology substituted for Prof. Clair N. Sawyer of M.I.T. who was prevented from attending because of illness.

"Every Day Control of Losses to the Plant Sewer" was discussed by A. C. Hyde of DuPont's Pollution Control Group, Belle, W. Va.

Mr. Hyde told of procedure followed in securing representative sampling of all plant wastes and their evaluation in terms of oxygen demand load on the stream; how leaking units had been traced down and corrected; how interests had been created in plant operating personnel in the matter of progressive river improvement; and, how wastes had been curtailed to the extent of reducing a population equivalent of 1,800,000 to about 300,000 as the result of tackling first things first in the pollution abatement program. One interesting disclosure was the scheduling of rates of individual waste discharge in order to limit the total pounds of B.O.D. discharged per hour to the river. Such was made possible only through the development of interest of the process foremen in the waste control program. The new process of chemical oxidation of certain wastes catalytically, under development at the Belle plant, held considerable promise of further progressive waste reduction.

Em. Van Patten, of American Maize Products Co., Robey, Ind., related how the waste curtailment program at his plant over a 6-year period had, through internal improvements and developing an interest in plant operating personnel, reduced plant waste to the extent of $175,000 per year. This represented the value of wasted materials going down the sewer before the curtailment program which has resulted in reduction of population equivalent from 400,000 to 28,000. This interesting story of the American Maize Products waste curtailment program can be read in full in an article by Van Patten and McIntosh in our December, 1951, issue.

A. C. Hyde, of DuPont Co., at this point told of their method of determining sewer flows by the rapid addition of 300 lbs. of sodium or potassium chloride to the sewer at point of turbulent flow and sampling the flow beyond for determination of content of sodium or potassium with the flume photometer.

Anaerobic Processes

"Anaerobic Digestion of Meat Packing Wastes" was discussed by W. J. Fuller of Geo. A. Hormel Co., Austin, Minn.

Mr. Fuller reported results being obtained on a pilot plant scale study of anaerobic digestion of meat packing plant wastes at Austin. The results from just 24 hours of anaerobic digestion appeared rather phenomenal. In the digester 75% of the solids float. The clear liquor beneath is returned to the mechanical flocculator and Im-

hoff type clarifier from which the solids (sludge) is transferred to the digester. The clarified waste is being applied to 6 ft. deep trickling filter at rate of 3.7 mgd. per acre to obtain a final effluent of 30 B.O.D. value. The overall B.O.D. reduction comes to between 90 and 95% although the period of anaerobic digestion is but one day. The digester loading is computed at 1/10th lb. of B.O.D. per cu. ft. capacity.

In reply to questions Mr. Fuller stated the digester temperature to be held at 90 to 92°F yielding gas of 80% methane content.

DR. A. M. BUSWELL, Univ. Ill., said that the high methane content of the gas was to be expected from meat packing wastes. As to digester loadings for very strong wastes (10,000 B.O.D.) the rate of 1 lb. of B.O.D. per cu. ft. of digester capacity appeared to be permissible.

"ANAEROBIC DIGESTION OF CORN CANNING WASTES" was reported upon by Fred. G. Nelson, Sanitary Engr., The Dorr Co., Los Angeles.

Mr. Nelson received pilot plant studies of thermophyllic anaerobic digestion of corn canning wastes at a temperature of 98°F conducted at the plant of the Lakeside Packing Co. Results indicated that process would reduce the B.O.D. of such wastes by 62 to 70%. As we understood it these studies were made some years ago.

Aerobic Processes

"TRICKLING FILTERS FOR DISTILLERY WASTES," were discussed by A. B. Davidson, Sanitary and Chemical Engr., The Schenley Distillers, Cincinnati, O.

Mr. Davidson outlined the advantages of high-rate trickling filters in the treatment of distillery wastes. Such filters are constructed of 3 to 4 inch stone and a recirculation ratio of 4 effluent to 1 of settled waste is employed for maximum filter performance and minimum ponding and fly breeding. The distillery waste of 550 B.O.D. value is applied to give a loading of 25 lbs. of B.O.D. per 1000 cu. ft. of filter bed. Routine operation and maintenance is as simple as that for sewage filters of the high-rate type. Ponding of surface had been quickly relieved by application of chlorine in the form of high-test hypochlorite powder. Application of copper sulphate was not effective. The pH of the applied waste at 5.0 produces satisfactory results but at pH 11.5 the stone is denuded of its oxidizing film. The fly breeding is noticeable but has not reached the nuisance stage. Neither has there been any odor nuisance.

Mr. Davidson commented on the importance of providing some sort of automatic sampling of influent and effluent if reliable performance records are to be expected. He then described a sampler which had been developed for use by the Schenley waste treatment plants.

"ACTIVATED SLUDGE IN TREATMENT OF STRONG WASTES" was discussed by Neil Hellmers, Engineering Service Div., E. I. du Pont Co., Wilmington, Del.

Mr. Hellmers pointed out that it was practical to apply up to 90 lbs. of B.O.D. per day per 1000 cu. ft. of trickling filter bed. The Activated Sludge process will take 20 to 30 lbs. of B.O.D. per 24 hrs. per cu. ft. of aeration tank volume. In the laboratory with proper control activated sludge had effected a 90% B.O.D. reduction with controlled loadings up to 95 lbs. per day per 1000 cu. ft. of aeration unit volume. The chief problem proved to be the bulking of the sludge. The Kraus (Peoria) process of feeding supernatant digester liquor proves a corrective. The application of chlorine at the rate of 2 to 5 ppm. based on influent to plant applied to the waste-sludge mixture also effectively corrected sludge balking.

A study of activated sludge for treating Kier Liquor from textile plants revealed the value of fortification of the nitrogen content of the mixed liquor. Nitrogen to the extent of 5 to 10 ppm. cut aeration periods to one-half the time otherwise required. 1500 ppm. of aerator solids were maintained for best overall results. The pH value of the waste between 6 and 9 proved an acceptable range and even a pH of 11 wasn't too damaging. High temperature of the Kier Liquor was overcome by increasing the ratio of returned sludge.

A. C. Hyde
Process Engr.
Du Pont
Belle, W. Va.

E. M. Van Patten
Bacteriologist
Am. Maize Prod.
Roby, Ind.

Rolf Eliassen
Prof. San. Eng.
M.I.T.
Boston

A. B. Davidson
Engineer
Schenley Dist.
Cincinnati, O.

Industrial Wastes Forum

E. N. Helmers
Eng. Service Div.
Du Pont
Wilmington, Del.

Fred. Nelson
Sales Engr.
The Dorr Co.
Los Angeles

W. I. Weisman
Engr.
Ozark-Mahoning
Tulsa, Okla.

H. E. Jacoby
Chem. Engr.
Genl. Am. Transptn.
New York

Industrial Wastes Forum

L. S. KRAUS, Supt. of Treatment at Peoria, Ill., reported that the average aeration tank loading at Peoria had been 55 lbs. B.O.D. per 1000 cu. ft. per day.

Digester Heating

"SUBMERGED COMBUSTION FOR DIGESTER HEATING" was discussed by W. I. Weisman, Engr., Ozark-Mahoning Co., Tulsa, Okla.

Mr. Weisman stressed the economy of submerged gas burning as a measure of evaporation and concentration as well as the heating of tanks of liquid or slurrys, including sludge digestion tanks. He described the latest non-corrodible ported burner head of graphite. No. 2 fuel oil is now being studied as fuel supply for submerged direct heating.

Sulfite Waste Utilization

"EVAPORATION AND BURNING OF CALCIUM BASE SULFITE WASTE" was reported upon by H. E. Jacoby, Chemical Engrs., Genl. American Transportation Co., New York.

Mr. Jacoby described a process developed in Sweden for the evaporation and burning of pulp mill sulfite waste liquors which had resulted in fuel savings of 35%. The liquor from the pulp digesters is evaporated to 60% solids content and burned under the boilers as liquid fuel. The steam yield had been 4700 lbs. per ton of pulp produced by the mill. The process had been in use for 6 years in Sweden. On the West Coast two mills had installed the process and in Wisconsin two mills will soon be using the process as the most overall economical solution of the stream pollution problem.

PLANT OPERATOR'S FORUM*

Dr. George E. Symons, Leader

One of the two Thursday morning concurrent sessions was devoted to a forum on sewage works operation. This was the popular "Operators' Forum" and was conducted this year by DR. GEORGE E. SYMONS, Consultant and Technical Editor, Larchmont, N. Y. The session was divided into four parts, with one topic for discussion presented in each part. There were no prepared papers and all remarks were from floor participants.

Chlorination

"IMPROVEMENTS IN CHLORINATION TO CONSERVE CHLORINE" was the first topic discussed.

Dr. Symons placed the subject before the group with the comment that shortages of chlorine in 1950 had led the Federation to appoint a Committee to study the problem of supply. This committee had reported at the Federation Board meeting, to the effect that the situation had improved. The Government had issued Order M-31 which had assured sewage works operators of more or less adequate supply. A joint committee with APHA, AWWA and the USPHS has been formed to continue to keep this matter of short supply before the industry and appropriate federal agencies, because it is believed that present prospects for obtaining a balance in production and consumption are still indefinite. Thus it appears that any steps an operator can take to improve the effectiveness of his chlorination will still be well worth while.

RALPH HOOT, Supt., Sewage Works, Philadelphia, Pa., spoke first on the subject and told of his experiences at Ft. Wayne, Ind., where, under his direction as superintendent, an automatic chlorination control system had been installed. The principal purpose of chlorination at that city is for odor control because of the nearness of athletic fields and other housing. Cost of the chlorination equipment including chlorinators, controller, program timers, etc., was $15,300, about one per cent of the cost of the plant. With this equipment, chlorination for odor control at Ft. Wayne has been programmed to flow and demand conditions, thereby saving chlorine by effectively controlled use.

HARRY FABER, Res. Chem., Chlorine Inst., N.Y.C., commented on the topic saying that unfortunately, there had been a general conception that chlorination is a simple process. This has resulted in more misleading and poor applications of chlorine than anything else. In satisfactory accomplishment of odor control, Mr. Faber, believes automatic control will be helpful, but it may or may not be helpful in other applications because there are so many factors to consider. The best way to conserve chlorine, according to Mr. Faber, is to understand the fundamentals of the chlorination process, what one is trying to do, and whether or not it is being accomplished as economically as possible. Faber recommended that operators refer to the Federation *Manual of Practice No. 4 on Chlorination*, to learn as much as possible about chlorination and the proper and economical addition of chlorine to sewage.

C. C. LARSON, Chemist, Springfield, Ill. San. Dist., asked who was to judge on the effective and economical use of chlorine. He mentioned case histories where one plant carries a few tenths of a part per million of residual chlorine while another carries 2.0 ppm. "just to be on the safe side." In sewage treatment, the amount of chlorine application to increase the residual from 0.1 to 2.0 ppm. is much more than 1.9 ppm. of chlorine. In large plants this difference can amount to a considerable poundage of chlorine. "How much of it is wasted?"

LOUIS K. EKSTRAND, Supt., No. Shore San. Dist., Waukegan, Ill., said that in his district, the principal object of chlorination is to control bacterial content of the sewage effluent, particularly where discharge is near bathing waters. They use enough chlorine to maintain a residual of 3.0 ppm.

At this point in the discussion, DR. SYMONS commented on the results of some research he had directed at Buffalo, N.Y., where it was shown that strength of sewage (chlorine demand), dilution available for final effluent, contact time, and desired level of residual bacterial content all are factors with which to reckon in determining the amount of chlorine added. At Buffalo, where the sewage is weak and high dilution is available, prechlorination before sedimentation with just enough chlorine to produce a residual of 0.1 ppm. after 15 minutes contact (a sub-residual after 45 minutes) is sufficient for the results desired. Careful hourly control of chlorine dosage is essential, however, to maintain the desired bacterial level in the final effluent.

H. O. LORD, Supt., Madison Metropolitan Sanitary District, explained how it had been possible to reduce chlorine consumption from three car loads a year to none by eliminating odors, which had formerly been the prime reason for chlorinating. Water traps, and forced ventilation of inlets to pumping stations has eliminated odors at these points.

A. E. GRIFFIN, Technical Service Director, Wallace & Tiernan, Newark, N.J., pointed out that the first way to conserve chlorine is to have other parts of a treatment plant functioning effectively. The second method is to know for what use chlorine is being added, and control it accordingly. A third method would be to know more accurately just how much residual really exists and if possible its relation to bacterial content (in short we need a new test). Mr. Griffin also commented on equipment available for programmed control of chlorine dosage, which assures chlorination at the rate desired, with little or no over- or under-chlorination.

W. H. BROWN, JR., Asst. Project Engr., Builders-Providence, Inc., Providence, R.I., spoke on the Builders Chlorinizer and how it could be set for programmed operation, or for proportional pacing from flow, methods which conserve chlorine by preventing over- or under-dosage, both of which are wasteful.

VAN PORTER ENLOE, Supt., Sewage Treatment, Atlanta, Ga., asked about up-sewer chlorination as a means of conserving chlorine. DR. SYMONS replied that where sulfates are high in the water, and where long sewer lines existed in which hydrogen sulfide was formed, the chlorine demand at the treatment plant could be reduced by adding a sub-residual upsewer, thereby preventing the development of sulfate splitting bacteria and hence hydrogen sulfide formation. It takes less chlorine to prevent hydrogen sulfide formation than it does to react with it. This is conservation.

On this same subject, HARRY FABER, pointed out that in Los Angeles, chlorine was added up-sewer "to conserve the treatment plant." In other words, the formation of hydrogen sulfide in the sewers so interfered with normal operation of the activated sludge plant that its capacity was re-

*This section reported by Dr. George E. Symons, Contributing Editor, Water & Sewage Works.

duced to about one fourth of the design. When up-sewer chlorination was practiced the full capacity of the treatment works was available for effective sewage treatment.

Meter Maintenance

"MAINTENANCE AND REPAIR OF METERS AND METERING EQUIPMENT" was the second topic presented to the Forum.

In introducing this topic, DR. SYMONS, as Forum Leader, said that regardless of the type of meter used, all of them may run into operating difficulties, and all probably need some maintenance, just as the family automobile does. He called attention to the availability of *"Keep Sheet No. 9 —Preventive Maintenance"* which was published as a part of *The Courier* of B-I-F Industries (Vol. 2, No. 4). This Keep Sheet is basic and although it was issued by Builders-Providence, Inc., it is applicable to any mechanical equipment.

plant service men be sent to school at the manufacturer's factory. This "specialist" should then have complete responsibility for the particular equipment maintenance, all other personnel should "keep hands off." Such a factory-schooled person might also be loaned to other nearby plants when they need help.

WALTER H. BROWN, JR., Builders-Providence, Inc., explained how a factory maintenance service plan works. Individual plants sign up for a regular, once- or twice-a-year visit from the factory service engineer or mechanic. This visit is scheduled on a route for the factory service personnel, and becomes a part of a regular trip. In this manner, the cost of the service call can be reduced considerably, first because the company offers a reduced service rate to such regular customers, and secondly because travel expenses are prorated among the several customers serviced on a single trip.

his problems. One night the cleaning man tore out all of the cables transmitting the flow from the Venturi to the recorder. How it was done, Mr. Wickersheim did not know, but it took him a whole day to repair the damage.

JOHN H. WIRTS, Cleveland, warned that Venturi tubes might become coated with "grease" and cited a case of a 60 inch meter which had a coating of five inches of grease at the inlet, with this coating tapering to nothing at the throat section. He thought this change in the size and shape of the meter would affect its accuracy, and wondered how much.

FRANK FLOOD, Partner, Metcalf and Eddy, Cons., Engrs., Boston, Mass., also spoke on this matter and commented on an installation where lime sludge deposited in the Venturi tube. Periodical cleaning was necessary, and the Venturi had to be bypassed.

DR. SYMONS commented on heating

Operators Forum

Leader	Chlorination Control				
Geo. E. Symons *Cons. & Tech. Ed.* *Larchmont, N. Y.*	*Ralph Hoot* *Supt.* *Sewage Works* *Philadelphia, Pa.*	*Harry Faber* *Res. Chem.* *Chlorine Inst.* *New York City*	*A. E. Griffin* *Tech. Serv. Dept.* *W&T* *Newark, N. J.*	*Van P. Enloe* *Supt.* *Sew. Treat.* *Atlanta, Ga.*	*W. H. Brown, Jr.* *Proj. Engr.* *Builders-Providence* *Providence, R. I.*

LESLIE WEST, Chief Engineer, Elizabeth Joint Meeting Sewage Works, Elizabeth, N.J., told of his experiences with Venturi meters on sewage lines. The importance of accurate meter readings is emphasized because the various communities pay their share of operating costs on the basis of meter readings. He prefers float operated connections to recorders rather than mercury wells, because the latter work well for a few years but then need factory service whereas the float operated wells can be serviced by his own staff. Mr. West also suggested that better provision be made for flushing the piezometer rings since this point is often the source of trouble due to sediment collecting in the ring, from which it can not be readily removed by flushing when the water is introduced at only one point.

JOHN H. WIRTS, Supt. Easterly Sewage Treatment Works, Cleveland, Ohio, said that he believed it takes a rather special talent, generally not available in sewage works, to repair and service meters. He suggested that

Mr. Brown also commented on Mr. West's suggestion for improving meter flushing systems. Present designs of Venturi meters have eliminated that problem with little or no effect on accuracy of the device.

THOMAS A. BERRIGAN, Chief Engr., Sewerage Div., Metropolitan District Commission, Boston, Mass., said the old Boston sewers had no metering devices, but that as fast as pumping stations are being converted from steam to diesel, meters are being introduced, but the maintenance problem has not yet been of any import.

LOUIS J. FONTANELLI, Supt., Rahway Valley Joint Meeting Sewage Works, said that the simpler the device, the less the problems when it comes to metering sewage. He commented on problems of electrical transmission of flow data from the primary measuring device to the recording instrument. He prefers float and cable transmission.

M. L. WICKERSHEIM, Supt., Sewage Treatment, Estherville, Iowa, has a small plant (2.5 mgd.) but he has

raw sludge lines with steam to remove grease coatings and the use of a go-devil for cleaning such lines. Both methods have been tried with some success in some cases and not in others. As to the matter of the change in meter reading with the change in grease he suggested that the error introduced by the coating would depend on the change in the angle of the inlet, the change in the roughness of the surface and the thickness of the coating. How much and in what direction could not be forecast simply, but it was doubted that the total error would be great as some of these effects produce compensating errors.

SOL SEID, Supt. Pub. Works, New Brunswick, N.J., suggested that to prevent wrinkling of charts during humid periods, louvres be placed in the station housing the recorder instrument. Inserting an electric bulb in the meter cabinet helped to eliminate the trouble.

ROBT. D. BARGMAN, Asst., Chief Engr., Hyperion Sewage Treatment Plant, Los Angeles, reported the

need for cleaning raw sludge lines after nine months. A go-devil was used. The inlet to the meter tube had to be cleaned by hand. Cleaning had little effect on the registration of the meter.

N. S. BUBBIS, Gen. Mgr., Greater Winnipeg San. Dist., asked if there had been any experience with orifice meters, and Walter H. Brown of Builders-Providence, Inc., replied that sharp edged orifices or weirs are not satisfactory for sewage and sludge.

BYRON KRUSE, Cons. Engr., Spencer, Iowa, said that his experience had shown that the Parshall Flume had few of the difficulties of a Venturi tube but that it was slightly less accurate.

HENRY VAN DER VLIET, Supt. Sewage Treatment, Rutherford, N.J., reported that he had a Parshall Flume and did have some trouble keeping it clean, particularly from grease which does affect the accuracy of the recording.

JOHN F. LABOON, Chairman, Allegheny County Sanitary Authority, suggested the insertion of a steel plate throat in the Parshall Flume to prevent deformation of the throat during cleaning.

Grit Removal

"PLANT IMPROVEMENTS TO INCREASE EFFECTIVENESS OF GRIT REMOVAL AND SLUDGE DEWATERING" was the third topic on the Forum, but time did not permit the discussion of sludge dewatering. All comments were confined to grit troubles. Dr. Symons opened the topic with a few remarks on the problem of grit in the sludge digesters at Buffalo, where fine sand, from street sanding operations, passes through the grit chamber, settles out in the primary tanks, and then lodges in the digesters. The cleaning problems at this plant were recently published in an article in *Water & Sewage Works*, by G. F. Fynn and G. M. Scheller.

KERWIN L. MICK, Supt. and Ch. Engr., Minneapolis-St. Paul San. Dist., agreed that fine sand comes from combined sewer operations. In his plant, to prevent carry over of grit from the grit chambers to the settling tanks, he decreases the rate of flow through the grit chambers during storm flows. Extra grit channels make this type of operation possible.

In reply to a question by CHAS. YOUNG, Pa. Dept. of Health, Mr. Mick said that apparently air flocculation did not wash organics out of the grit and make it more susceptible to settling in the flocculators.

Mr. Van der Vliet of Rutherford N.J. reported 12 ft. of grit and sludge mixture in a digester where there is no combined system.

DR. WM. D. HATFIELD, Supt. San. District of Decatur, Ill., told of his first grit chambers of twenty years ago, when a mixture of grit and packing plant paunch manure had to be shovelled out by hand, every so often. Now continuous grit removers and washers produce a generally clean grit easily handled. Grit characteristics vary with the seasons, however, and leaves in the grit chambers present a problem in the autumn. The velocity through the grit chambers has been reduced from 1.0 to about 0.35. ft. per sec. with the installation of cleaning and continuous removal mechanisms and better grit removal is accomplished. Reducing the velocity through the grit chambers and mechanical handling of grit both help improve the whole operation of grit removal.

FRANK FLOOD, Boston, Mass., observed that aerated grit channels at Columbus, Ohio, apparently removed both large and fine grit from the hoppers, and did not cause the fine grit to carry over. The grit, which accumulates, is freer of organic material than is ordinary grit. This is an improvement.

WALTER H. SPERRY, Supt., Aurora, Ill., reported good results in the handling and removal of grit, sludge and hair in a digester using a flap-valve pump instead of a ball valve pump.

CARL CARPENTER, Supt., Hammond San. Dist., Hammond, Ind., reported success in operating a plant which involves the use of air for pre-aeration and grit washing and removal. The grit, washed and removed with air, is much cleaner than is grit unwashed in this manner. Fine grit does not carry over to the settling tanks.

JOHN H. HESS, Supt., Fremont, Ohio, said he had had trouble with a fine silt, and asked if air washing would help the problem. No answer was available.

C. C. LARSON, Chem., Springfield, Ill. San. Dist. asked why it was necessary to clean out digesters; why not, he asked, just let the grit accumulate to its natural angle of repose and forget it from then on?

In reply to the question, five persons had an answer; all good. WALTER SPERRY of Aurora, Ill., said that accumulated grit broke stirring mechanisms in his digesters. W. W. MATTHEWS, Supt., Gary, Ind., has a "terrific" amount of sludge-grit mixture accumulate in his digesters and it interferes with stirring mechanisms as well as being piled up on one side, not just a "doughnut ring" as Larson suggested.

N. S. BUBBIS, Winnipeg, Can., noted the problem of grit is definitely connected with combined sewer operation. The fine grit eventually gets to the digesters and then to the sludge dewatering system where it causes trouble. L. J. FONTANELLI, Rahway, N.J., noted that the grit-sludge built up so high in his tanks that it interfered with his heating coils and heat transfer. DR. SYMONS reported that at Buffalo, not only was the capacity of the digestion tank seriously reduced by grit accumulation, but the grit piled so high that it broke the internal water heating coils.

GORDON L. BORT, Sewage Disposal Engr., Portland, Ore., reported that he had started up Portland's first sewage plant only ten days before and while he had grit chambers, washers and equipment for handling grit, he

Operators Forum
Meter Maintenance Problems

Sid Seid
Supt.
Pub. Util.
New Brunswick, N. J.

Leslie West
Ch. Engr.
Jt. Mtg. Plant
Elizabeth, N. J.

T. A. Berrigan
Ch. Engr. Sew. Div.
Metr. Dist. Comm.
Boston, Mass.

L. J. Fontanelli
Supt.
Jt. Mtg. Plant
Rahway, N. J.

Frank Flood
Cons. Engr.
Metcalf & Eddy
Boston, Mass.

John H. Wirts
Supt.
Easterly Plant
Cleveland, O.

Operators Forum
Grit Handling Problems

K. L. Mick
Supt. & Ch. Eng.
San. Dist.
Minn. St. Paul, Minn.

W. D. Hatfield
Supt.
San. Dist.
Decatur, Ill.

C. C. Larson
Supt.
San. Dist.
Springfield, Ill.

W. A. Sperry
Supt.
San. Dist.
Aurora, Ill.

A. A. Appel
Supt.
Sew. Maint.
Los Angeles, Calif.

Carl Carpenter
Supt.
San. Dist.
Hammond, Ind.

had no grit. He does have silt, in his Venturi meters, etc., but no grit.

ALVIN A. APPEL, Supt., Sewer Maintenance, Los Angeles, Calif., asked about the problem of coffee grounds as garbage grinders come into more prevalent use. He also suggested a vacuum type pump for the removal of oil and grit from pumping wet wells.

Combined Sewers

"COMBINED SEWER OPERATION" was the last topic on the Forum program, and inasmuch as the previous topic had considered several phases of the matter of combined sewers, the time devoted to this particular subject was limited.

KERWIN L. MICK, Chief Engr., and Supt. Minneapolis-St. Paul San. Dist., Minneapolis, Minn. and Chairman of the Local Arrangements Comm. for this meeting of the Federation, said that his district had about 1500 miles of combined sewers and 212 miles of storm sewers. Fifty-two miles of interceptors pick up 75 old outlets, along with 20 mills. Forty-four per cent of the interceptor capacity is allotted to storm water, 17 per cent to industrial waste, 22 per cent to domestic sewage, and 17 per cent to infiltration.

The determination of the amount of infiltration is important because the cost of plant operation is apportioned between the two cities on the basis of volume. The main interceptor shows ground water infiltration amounting to 70,000 to 100,000 gal. per day per mile of sewer. This is not considered high since the sewer run up to 14 ft. in diameter and is some 40 ft. below the ground water level. Most of the leakage is at original construction joints. One leak of 350 gpm. was repaired.

Deposits have been found in the sewer on the inside of the curves and extend for 100 or more feet along the curve. Deposits consist of boulders, rags, sand, gravel, grit and may be as much as 18 in. deep. When cleaned out, the deposits accumulate to about the same depth again. Since the depth does not become any greater, it has been decided not to clean the deposits.

Although the plant will take 615 mgd. hydraulically, problems from grit and sand being flushed into the plant occur when the flow goes above 1.5 to 1.75 times the dry weather flow.

A few questions were asked of Mr. Mick, but these were not specifically related to the topic under discussion. The session was closed soon thereafter by immediate past President RALPH E. FUHRMAN, Supt. Sewage Works, Washington, D.C.

"Charlie" Roos Honored by E. St. Louis C. of C.

Charles M. Roos, manager of the Interurban Water Co. which serves East St. Louis and environs, has been named East St. Louis' "Man-of-the-Year" by the local Chamber of Commerce, which gave a dinner in his honor.

The award of "Man-of-the-Year" is made to the man who has done more civic work in the interest of the community than others. The citation stated—"If anything worth while is going on in East St. Louis, Charlie Roos is either in it or on it . . . He is always willing to work with any group engaged in an effort to serve mankind and our community."

Formerly General Manager of the Water Company in Peoria, Ill. and later Cairo, Ill., he has served as General Manager of the East St. Louis Co. (all Am. Water Works Co. plants) for the past 12 years. To list the number of civic undertakings in which "Charlie" Roos has been a leader, and the number of organizations of which he is a "wheel-horse" member is more than we have space for. We will add, however, that "Charlie" Roos has always been that way ever since we knew him first in Cairo, Ill.—and this is some time back.

Professor McGauhey in Charge of Sanitary Engineering Research

Professor P. H. McGauhey, formerly head of the Civil Engineering Department at Virginia Polytechnic Institute, is now in charge of the University of California Sanitary Engineering Research Projects at Richmond, California.

He taught at V.P.I. from 1927 to 1951 with the exception of two years on leave to the University of Southern California where he reorganized the Sanitary Engineering Division. Professor McGauhey is a graduate of Oregon State, and has advanced degrees from the University of Wisconsin and V.P.I.

IN TRAINING . . .

Our young hero, like many another, wants to be a fireman when HE grows up—and, he ain't kiddin' either!

WATER & SEWAGE WORKS

Report from Abroad

Sewage Treatment Practices in Great Britain

Notes and Comments

by JOHN FINCH, *Manager, Sewage Disposal Dept., Rotherham, England*

ONE of the most interesting recent major developments in sewage treatment practice in Great Britain is the considerable improvement that has been brought about in the efficiency of mechanical methods of aeration. The medium involved is activated sludge and, in particular, the Haworth or Sheffield system of Bio-aeration and the Simplex system of surface aeration, for which recently modified processes claims have been made that cannot be ignored.

Incidentally, contrary to the views of some workers in the U.S., the expression "Bio-aeration" is only associated with John Haworth's Sheffield system of activated sludge, and not with the whole range of mechanical aeration processes in general. The latter are usually classified as Surface Aeration processes.

Mechanical Means of Aeration

In the U.S. and in Great Britain it has been considered in the past that activated sludge processes making use of mechanical aeration generally failed because the oxygenation capacity of the process was poor, that the plant could not maintain high the concentrations of sludge solids usually carried by diffused air plants and that, accordingly, the process was only about one-third to one-half as efficient as the diffused air plant. In consequence of these disadvantages, the mechanical aeration process has lagged sadly behind its diffused air contemporary.

However, the position has now changed somewhat considerably and the classical paper by Mr. J. H. Edmondson, the General Manager of the Sheffield Sewage Disposal Department, on the Bio-aeration process and the modifications to that process for which he has been responsible, has brought the spotlight of progress to focus once again upon this method of treatment, which on its inception in Great Britain found much favor. Furthermore, authoritative opinion in certain quarters has it that this development may well prove to be a landmark and a turning point in the progress and life story of an activated sludge process of sewage treatment, which over the past years has not been very satisfactory from the point of view of economics and has caused much disappointment and heartburning.

However, whilst mechanical aeration processes have been accepted more often than not as being less efficient than diffused air processes, they have also been accepted as being comparatively trouble free from the point of view of maintenance, and in this respect have had at least one substantial advantage over diffused air processes using porous media.

The old porous plate used in some diffused air sewage treatment plants has gained throughout its career a not inconsiderable or unwarranted amount of notoriety as a result of the frequency with which it clogged and ease with which it and its complementary cast-iron cover broke when attempts were made to remove them for cleaning purposes. At the same time, judging from the lavish layouts seen at some of the larger works, the porous tile cleaning and reconditioning shops appear to be sizeable and therefore very costly liabilities.

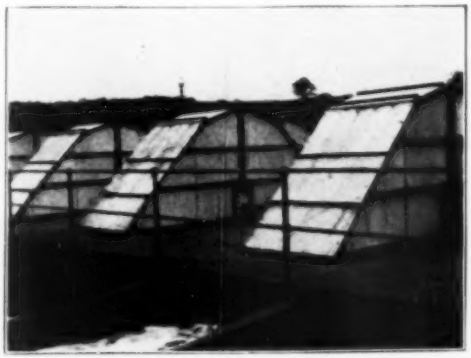
Similarly other forms of diffusers, whether they be tubes, domes, etc., invariably tend to clog and have to be laboriously cleaned or replaced at high cost. Coupled with these troubles are items such as increase in power consumption at the blower due to high pressures caused by clogging of the diffusers.

Whilst then they had lower efficiencies than the diffused air sewage treatment plants, the considerable advantage claimed for some of the mechanical aeration forms of activated sludge plant over the diffused air plant using the conventional form of diffuser of one type or another, is the much lower maintenance costs of the comparatively simple mechanism when compared with the costs of diffuser servicing and replacements.

In this respect, in Great Britain there are examples of mechanical installations which in operational periods of up to almost 30 years have cost in maintenance an almost infinitesimal sum, and several of these plants working under arduous conditions with large qauntities of industrial wastes in the sewage.

Reverting back to Bio-aeration, up to very recent years when and where it has been possible to compare this process with other processes (Croydon and Manchester) making use of activated sludge principles, it has been considered that Bio-aeration was easily the least efficient and, in point of fact, at Manchester it has been stated that when producing effluent of similar chraacter the various units of diffused air plant have required an average of 29.9 H.P. per million gallons as compared with 27.4 H.P. for the Simplex plant and 42.8 H.P. for the Bio-aeration plant and that the corresponding retention periods are 10.0, 13.0 and 17.3 hours respectively.

At the 1951 Summer Conference of the Institute of Sewage Purification held at Buxton, Mr. Clarence Jepson, General Manager of the Manchester Rivers Department proposed a very hearty vote of thanks to Mr. J. H. Edmondson for his Paper on the Modified Bio-aeration Plant, and said that whereas the average results of 15 years of operation of activated sludge plants at Davy-



BIO-AERATION—Paddle wheel type aerators

hulme placed Bio-aeration at the bottom of the list in terms of horse power per million gallons, the modified plant now produced a figure of 23.4 H.P. per million gallons with a detention period of 12 hours and reversed the order.

Mr. Jepson spoke generally in glowing terms about the improved performance of his modified Bio-aeration units and rather gave the impression that even at Manchester, the home of the activated sludge process, Bio-aeration in its modern and improved form had set them thinking very seriously.

Speaking of the development of the modification of the Bio-aeration process, Mr. Edmondson in his Paper says that the experimental work was directed towards providing vigorous aeration at the paddle wheels for the purpose of breaking up the surface of the liquid in the channels. (It may be recalled that John Haworth had the strong conviction that stream flow surface aeration was the main source of oxygen supply as far as his plant was concerned and caused him eventually to construct the Woodhouse Mill unit at Sheffield without paddle wheels, the velocity of flow being maintained by fall along the channels, the first and last channels being connected by a pump. The performance of this particular plant was a great disappointment to Mr. Haworth.)

Furthermore, it is stated by Mr. Edmondson that the solution of oxygen in the tank contents in the Bio-aeration process appears to be due to film formation and spray playing in the atmosphere immediately above the top water level in the channels; the breaking of the water

Statistics relating to the Manchester, Davyhulme plant

Raw Sewage	Oxygen Consumed	121 ppm.
Raw Sewage	B.O.D.	247 ppm.
Raw Sewage	Susp. Solids	220 ppm.
Settled Sewage	Oxygen Consumed	89 ppm.
Settled Sewage	B.O.D.	173 ppm.
Settled Sewage	Susp. Solids	62 ppm.
Diffused Air	Oxygen Consumed	29 ppm.
Diffused Air	B.O.D.	20 ppm.
Bio-Aeration	Oxygen Consumed	27 ppm.
Bio-Aeration	B.O.D.	18 ppm.
Simplex	Oxygen Consumed	28 ppm.
Simplex	B.O.D.	18 ppm.

surface in the channels by the returning film and spray; the trapping and carrying of air into the water by the paddle blades, and the stream flow surface aeration. Withall, the oxygen input in the modified plant can be increased by over 100 per cent, the probabilities being that the most important source of this oxygen is through the formation of spray and film in large quantities.

The existing Bio-aeration plant at Sheffield was designed to treat 18 m.g.d. of dry weather flow and, when the modifications to the plant have been carried out, it is anticipated that this same plant will treat well over 30 m.g.d., the most striking results being obtained when the plant is treating concentrated sewage during a long spell of warm, dry weather.

By increasing the speed of the paddle, by changing the shape of the paddle blade, and by diminishing the depth of immersion of the paddle blade, Mr. Edmondson has improved the performance of the Sheffield plant out of all recognition and has caused the most enthusiastic diffused air supporter to sit up and take notice.

All this improvement has taken place at a fairly old plant and at almost insignificant cost.

The question now being asked in Britain is "What could Mr. Edmondson do with a newly designed plant and which Authority is likely to be the first to construct one?"

The Modified Simplex Process

I recently had the opportunity of studying at a sewage works in the North of England a modification of another

BIO-AERATION—Simplex type aerators

form of mechanical aeration plant. This was in the shape of a comparison of the old "Simplex" cone and the modification the new High Intensity Cone manufactured by Messrs. Ames Crosta Mills & Co. Ltd., both working side by side on as strong industrial sewage. The new High Intensity Cone was most impressive in action and doing a remarkably good job of work on a very difficult sewage.

The High Intensity Cone is an entirely new design and differs radically from the old standard cone in its general proportions and particularly in the form and disposition of the blades. It is so constructed as to discharge a large volume of liquid in the form of a torrent on to the surface near the center of the aeration tank and creates an extremely rapid and heavy wave motion over the entire liquid surface in the tank. This wave motion of course greatly increases the area of the liquid surface in contact with the atmospheric oxygen and produces conditions ideal for the speedy solution of oxygen.

Points of interest relating to the High Intensity Cone are that the Cone circulates the aeration tank contents once in about 5 to 8 minutes, or at least three times faster than the standard cone; more dissolved oxygen is introduced into the sewage in a given time and this oxygen rapidly and evenly diffuses throughout the tank contents, and the oxygenation capacity of the aeration tank is greatly increased.

A point of some consequence is the claim that the High Intensity Cone enables higher concentrations of activated sludge to be carried in the aeration tank; as a result, the higher sludge concentration along with increased aeration and circulation intensifies the biological process and thereby reduces the time required for purification.

With High Intensity Cones, therefore, aeration tank volumes can be reduced by about one-quarter to one-third. By the substitution of these Cones for standard cones, existing surface aeration plants can treat up to 50 per cent more settled sewage, and this without increasing overall power consumption per unit volume of sewage treated.

A series of *Reports from Abroad* by Mr. Finch will present topics and opinions of timely interest. The author is chairman of the Northeastern Branch of the Institute of Sewage Purification, and a frequent contributor to British technical journals. He will welcome the opportunity of replying personally to readers of *Water and Sewage Works* who have questions or require additional information regarding the subjects discussed.—The Editors.

"TRACTO-SHOVELS" loading sludge onto farmers trucks. Third loader not in picture.

Mechanical Handling of Vacuum-Filter Sludge Cake

Experience, equipment and practice at Baltimore, Md.

by C. E. KEEFER,* *Deputy Sewerage Engr., Baltimore, Md.*

IN a city the size of Baltimore, where 175 to 200 tons of sludge-cake from vacuum filters, containing 75 to 78 per cent moisture, is handled and disposed of seven days a week, considerable personnel and equipment are needed to provide an uninterrupted flow of dewatered sludge from the filter installation. To perform this function, belt conveyors, cranes, tracto-shovels and trucks are required to deposit the sludge in piles on the grounds at the sewage-treatment works, and also to load farmers' and gardeners' trucks with the sludge.

Prior to 1939 the digested sludge at the Back River Sewage Treatment Works, which serves Baltimore City, was dewatered on 13.3 acres of sludge drying beds. The cake from these beds, which usually had a moisture content somewhat below 70 per cent, was hauled by 3-ton gasoline locomotives in 1-cu. yd. industrial railway cars to a sludge dump on the plant site. A 5-ton gasoline engine operated crane, equipped with a ½-cu. yd. clamshell bucket was stationed at the sludge dump for loading farmers' trucks, who hauled the material from the sewage-plant site. By following a policy of not charging for the sludge or for loading the takers' trucks, it was possible to dispose of the greater portion of the material.

*Editorial Associate, Water and Sewage Works.

Unexpected Difficulties

When the sludge beds were abandoned in 1939, and dewatering the sludge by vacuum filtration was adopted, certain unexpected difficulties were encountered. As the filter cake contained considerably more moisture, its physical characteristics differed materially from that removed from the sand beds. It had a pasty consistency, which rendered it difficult to spread on the ground. The result was that the demand for the material dropped off decidedly. Then, during the war years from 1943 to 1945, farmers were prohibited from entering the grounds of the sewage plant for reasons of defense. After once adopting this policy it was most difficult to interest farmers in removing the sludge after the war ended. From 1945 to the fall of 1949 there was some sludge removed by farmers (Table 1), but the quantity was insignificant.

A New Try

In September, 1949, advertisements were inserted in the local newspapers for an extended period of time. The response by farmers and gardeners was immediate. At times the quantity hauled away amounted to 600 tons daily. In some instances the sludge has been hauled 20 miles or more.

Table 1
VACUUM FILTER CAKE PRODUCED AT THE BACK RIVER SEWAGE WORKS

Year	Sludge Cake Produced (Tons)	Annual Hauling Cost*
1939	24,351	$ 5,075
1940	42,196	7,725
1941	47,264	7,914
1942	49,150	8,995
1943	44,964	14,527
1944	55,898	15,052
1945	50,625	27,305
1946	47,375	18,007
1947	57,351	21,102
1948	32,025	22,451
1949	40,406	36,957
1950	64,252	47,703

*To city dumps and loading farmers' trucks.

It was found necessary to secure additional equipment to load farmers' trucks. In September, 1949, an Allis-

Chalmers "Tracto-Shovel" costing $8,864 was purchased.

This piece of equipment (see picture) proved ideal for the service. It is provided with a Diesel engine and travels at a maximum speed of 5.5 miles per hr. Its 13-in. wide track-shoes permit it to be operated in soft ground. The pick-up bucket, which has a capacity of 1 cu. yd., can be elevated to a height so that trucks can be quickly loaded. It normally takes about 5 minutes to load a 5-ton truck.

As the demand for the sludge continued to increase, a second "Tracto-Loader" was purchased in November, 1949, and a third in July, 1950. These three machines were supplemented by a gasoline-engine-driven caterpillar mounted Koehring crane equipped with a 40-ft. boom and a ½-cu. yd. clamshell bucket. The cost of the three "Tracto-Shovels" and the crane amounted to $38,614.

By the end of September, 1949, just prior to the time when the farmers began to haul the sludge away from the sewage plant in unprecedented amounts, the sludge cake had been deposited over an area of approximately 100 acres (See Table 1 for amount of annual cake production) to an average depth varying from 4 to 5 feet. By September, 1951—within a period of two years—this area had been reduced to less than 25 acres. It is anticipated that the sewage plant will be practically cleared of sludge cake within the next year or two.

Table 2
TYPICAL ANALYSES OF VACUUM FILTER CAKE

Analyses	As Discharged from Filters	From Field Storage Piles
Moisture, %	74-78	25-40[1] 50-70[2]
N as NH_3, %	3.0-3.5	2.0-3.0
Phosphates as P_2O_5, %	2.0-3.0	1.5-2.5

(1) Surface crust. (2) Approx. 1 ft. below surface.

Analyses of Sludge Cake

Table 2 gives the typical analyses of the sludge cake as it discharges from the vacuum filters and as it is when removed from the piles in the fields where it has been stored for several years. There is a reduction in the sludge moisture from approximately 74-78 to 25-70 per cent, in nitrogen as ammonia from 3.0-3.5 to 2.0-3.0 per cent and in phosphates as P_2O_5 from 2.0-3.0 to 1.5-2.5 per cent. This sludge is an excellent soil conditioner and serves as a good dressing for lawns.

Heat Dried Sludge Soon

The problem of final sludge disposal will shortly be solved with the completion of a heat drying plant, that is being constructed at an approximate cost of $2,100,000. This plant, which will contain three flash dryers with space for a spare unit, will be capable of producing 75 tons of dry solids daily. The sludge will be sold to producers as a base for complete fertilizers.

The Back River Sewage-Treatment Works is under the general supervision of P. L. Holland, director, Department of Public Works, with John J. Hunt, sewerage engineer.

C. E. Keefer Becomes Editorial Associate

Clarence E. Keefer of Baltimore, Md., who has been a valued contributor of articles to *Water & Sewage Works* over a period of years, has accepted our invitation to become an Editorial Associate.

Mr. Keefer, who holds the responsible position of chief Deputy Sewerage Engineer for Baltimore, has direct charge of design, operation and maintenance of the sewage treatment works of Baltimore. He is probably most widely known for his text "*Sewage Treatment Works*" published by the McGraw-Hill Book Co. He also was a contributor to "*Modern Sewage Disposal*," published in 1938 by the Federation of Sewage Works Assn's and also "*Elements of Sanitation*" published in 1939 by D. Van Nostrand Co. In addition he has authored more than ninety articles dealing with sewerage practices, or reporting the results of experimental and developmental work at the Baltimore plant.

For his contributions to the science of sewage treatment Mr. Keefer has been a recipient of two awards of the Federation of Sewage & Industrial Wastes Assn's—the Kenneth Allen Award (1947) and the Geo. B. Gascoigne Medal in 1950.

Mr. Keefer is a graduate of Johns Hopkins University (B.S. in Civil Eng. 1919) and took graduate work in chemistry at J.H.U. thereafter. He has also served his Alma Mater as Instructor in Sanitary Engineering during his tenure with the City of Baltimore. In addition, to further his education in sewage treatment, he has visited England, Germany and other countries on three occasions to study and observe sewage treatment as it is practiced abroad. Within recent years he has to his credit the invention of equipment, now widely used in sedimentation units and sludge digestion tanks, and presently marketed by fabricators of sewage works equipment.

Keefer has directed extensive work of an investigational and research nature pertaining to sewage treatment. Amongst these were studies of high-rate trickling filters, digestion of ground garbage with sewage sludge, methods of dewatering sewage sludges, grinding of screenings, the performance and behavior of the activated sludge process, heating of sludge digesters, studies involving sewage chlorination and the lime-chlorine process for production of chloramines in sewage and effluents, chlorinated-copperas in sludge dewatering. These are but a few problems investigated at the Baltimore plant on Back River.

Mr. Keefer is a member of a number of scientific and professional societies, including the Am. Soc. Civil Engrs., the Am. Water Works Assn., the Am. Pub. Wks. Assn., the Inst. of Sewage Purification (British), the Am. Pub. Health Assn., the Inter-American Assn. of San. Engrs., the Federation of Sewage and Industrial Wastes Assns., which he served for a term as member of the Board of Control, representing his Md.-Del. Water and Sewerage Assn. He has served on a number of committees in these organizations and has the distinction of being a past-president of the Maryland Section of the Am. Soc. of Civil Engrs., which he previously had served as secretary and treasurer.

We take pride in being able to introduce to you our newest Editorial Associate, who will also be contributing articles regularly and, we hope, frequently. Mr. Keefer will also contribute to the editorial development of *Water & Sewage Works* in other directions.

Rapid Photometric Estimation of Process Efficiency

Sewage loading and treatment results indicated by measurement of light transmission.

by W. WESLEY ECKENFELDER, JR., *Consulting Sanitary Chemist*
Ridgewood, N.J.

IN many instances in sewage treatment plant operation, it is desirable to provide a rapid analysis of the process efficiency in order to evaluate applied organic loadings and effluent quality.

To derive process performance data on a continuous basis, the analytical methods employed should be applicable with the least possible technical equipment and with the least degree of operational skill. Work on Ridgewood, N.J. sewage has indicated that light transmission measurements will often adequately fulfill the above mentioned factors. Light transmission measurements are also used for a wide diversity of other applications.

The rapid development of photometric analysis and its application to the sanitary field has presented a versatile tool for use in many sewage and waste treatment problems. Photometric methods are now used for analytical determinations involving color changes and intensities and for the measurement of turbidities[1]. In addition to the above analytical procedures, the direct measurement of light transmission through a sample may in many cases also serve as an indicator of existing pollution and as a criterion of pollution removal; this is evident in Fig. 1.

Turbidity determinations have been applied in the measurement of chemical coagulation treatment process efficiency by Bell[2], who found a correlation to exist between the turbidity and B.O.D. of sewage and wastes. Rudolfs and Gehm[3] reported that turbidity measurement could be correlated with oxygen demand in chemical precipitation processes. Watson and Weir[4] also employed turbidity measurements to reveal effluent quality. Setter et al[5] developed a method to determine the suspended and settleable solids in a sewage by light absorption methods. Suspended solids were also measured photoelectrically by Holmes[6]. A photron reflectometer was used by Gehm and Trubnick[7] for turbidity measurement. The possibilities exist of a wider application of the turbidity measurement to sewage treatment processes, and to biological processes in particular.

The application of light transmission measurements to sewage plant effluents applies to the quality of the effluent particularly in an esthetic sense. A clear sparkling effluent invariably denotes good treatment to the layman; while a turbid effluent, characteristic of poor or inefficient treatment, is judged as pollution.

Sewage is composed to a large degree of suspended and colloidal particles of organic matter (cellulose, soap, etc.) which contributes a major portion of the oxygen demand. The amount, nature and behavior of organic constituents are significant factors in sewage purification processes[8]. These factors may often be determined quantitively by measurement of light transmission and by relating the measurement to variation in sewage strength over the 24-hour period. Likewise, the effluent quality with respect to clarification may be recorded and the relative efficiency of treatment rapidly evaluated.

Early work by Adeney[9] indicated that 80 per cent of the total organic carbon in sewage was either in the colloidal or suspended form, and hence measurable by photometric means. Work at the Ridgewood laboratory indicated that, in local sewage, a somewhat higher portion of the B.O.D. was measurable by means of light transmission.

According to *Standard Methods*[10], a distinction is made between suspended solids and dissolved solids, the suspended solids being that portion retained by Gooch filtration. The technic employed in our transmission measurements allowed for settling time in order to remove the large settleable solids. The remaining components, measured as per cent light transmission, include the suspended solids retained on a Gooch crucible and the fine suspension or colloids which are not retained by the Gooch. Settleable solids are not measured. An alternate procedure may be employed in which the sample is homogenized to attain a greater uniformity of particle size. The work of Setter was based upon the use of the Waring Blender to attain a greater uniformity of particle size.

True colloids in the sewage represent less than 10 per cent of the total suspended solids[9]. The truly dissolved constituents will not be measured by light transmission. For example, a sewage examined after settling 15 minutes indicated a light transmission

Fig. 1—Light transmission differences in sewage before and after treatment. First beaker contains raw sewage; second beaker a sample of clarified effluent; and third beaker a sample of nitrified effluent.

Ed. Note: This paper, presented before the Am. Chemical Society, has been released for publication in *Water and Sewage Works*.

of 64 per cent; after filtration through a Gooch crucible, this sewage indicted a light transmission of 84 per cent. The suspended solids as measured by *Standard Methods* in this sample were 60 ppm. and the total solids were 425 ppm. Hence, the transmission measurement determines all the solids except those which will not absorb light. A relationship was found to exist between per cent light transmission and sewage dilution. Setter[5] also found direct relationships between light transmission and solids concentration.

In a domestic sewage, in which the organic materials are predominantly in the colloidal or suspended form and measurable by photometric means, a correlation may be found to exist between the oxygen demand of sewage (as measured by oxygen consumed or B.O.D. values) and the per cent light transmission. The relations obtained at Ridgewood are illustrated in Figs. 2 and 3. The data illustrated are based on results derived over a period of several months, during which time both activated sludge pilot plants and trickling filters were operated.

The relationships shown on Figs. 2 and 3 will vary in relation to the concentration of trade wastes, insolubles such as clay, silt, etc. Hence, in many instances, no such consistent relation will be found. However, a relation will generally exist between the raw sewage and the sewage after treatment; this relation will be determined by the efficiency of the treatment device. Results from the study of trickling filters and conventional and modified activated sludge treatment units have revealed that the reduction in oxygen demand may be closely approximated by per cent light transmission increase. It is to be understood that any absolute relation will vary as the character of the sewage, the type of treatment, etc., but the relation should be generally applicable.

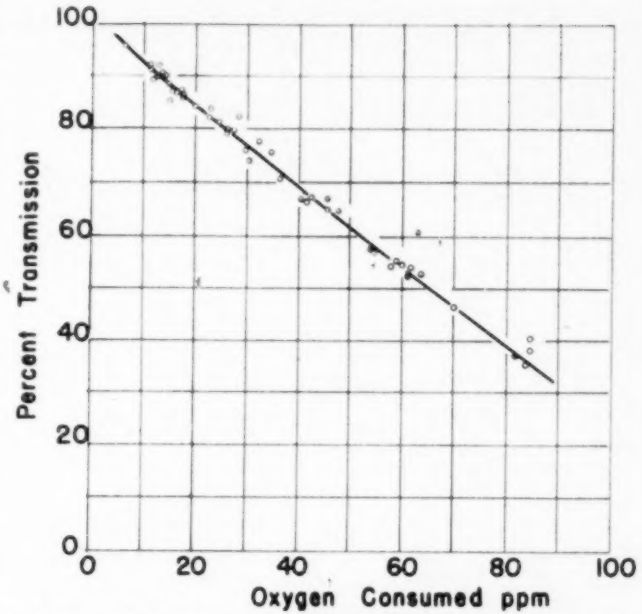


Fig. 2—Ridgewood, N. J., Sewage. Calibration curve illustrating relation between light transmission and oxygen consumed by permanganate.

Sewage Aeration

A series of experiments were conducted to determine the changes in light transmission with respect to the time of aeration, and to study the relation between biological and chemical variables and the subsequent clarification of the sewage. During the first phase of the aeration step, the per cent light transmission increases rapidly with respect to time. Accompanying this clarification is the production of a floc or sludge, with a proportional reduction in the oxygen demand of the substrate. The ammonia and alkalinity likewise are rapidly reduced. The maximum clarification is obtained in about 25 per cent of the time required for complete oxidation of the substrate at 25°C[11]. In the sewage aeration studies conducted at Ridgewood, the reduction in the oxygen demand of the subtrate was found to be directly proportional to the increase in light transmission.

Table I

Light Transmission Changes in Sewage Aeration at 20°C

Aeration Time hrs.	M. O. Alk. ppm	NH_3-N ppm	NO_3-N ppm	Oxygen Cons'd. ppm	% Light Transmission
0	256	30.8	——	78.2	52.5
2	241	27.0	——	55.0	60.5
4	228	25.0	——	41.0	63.5
6	218	23.0	——	28.0	76.5
8	212	22.0	——	23.5	81.0
10	202	——	——	——	84.5
46	154	14.0	7.0	——	92.0
70	85	6.7	15.7	——	96.0

Activated Sludge Processes

The determination of per cent light transmission is in many respects ideally suited to evaluation of the efficiency of an activated sludge treatment process. Parsons and Wilson have described the activated sludge process as occurring in three general overlapping stages; namely, clarification, reactivation of the powers of clarification, and nitrification. While the exact nature of the clarification stage has not been established, it is generally considered to involve both physical and biological factors. The extent of the clarification can be measured as per cent light transmission.

Fig. 4 illustrates the measurement of the degree of purification of domestic sewage accomplished by activated sludge at Tenafly, N.J., and also the relation between light transmission changes and B.O.D. reduction. After the initial principal removal of B.O.D., the effect of further contact and oxidation was not detectable by light transmission measurement. Oxidation and the resulting production of nitrates, as illustrated in Fig. 4, must be determined by other methods.

Table II

Light Transmission Measurements in Activated Sludge Process Pilot Plant: Raw Sewage 59 Per Cent, Recycled Sludge 41 Per Cent

	M.O. Alka. ppm	D. O. ppm	BOD* ppm	Oxygen* Cons'd. ppm	NH_3-N ppm	NO_3-N ppm	% Light Transmission*
Raw Sewage	223	0	284	100	16.3	——	35.3
Pre-aeration	214	0	220	81.5	21.6	——	44.5
Prim. Clar. Eff.	228	0	239	92	21.5	——	43.0
2' along aerator	152	1	42	20	12.5	——	89.0
8' along aerator	141	1	45	——	——	——	90.0
16' along aerator	130	1	21	20	7.7	6.8	97.5
Clarifier	128	1	17	——	——	——	98.0

*Light Transmission, B.O.D., and Oxygen Consumed values determined on settled liquor.

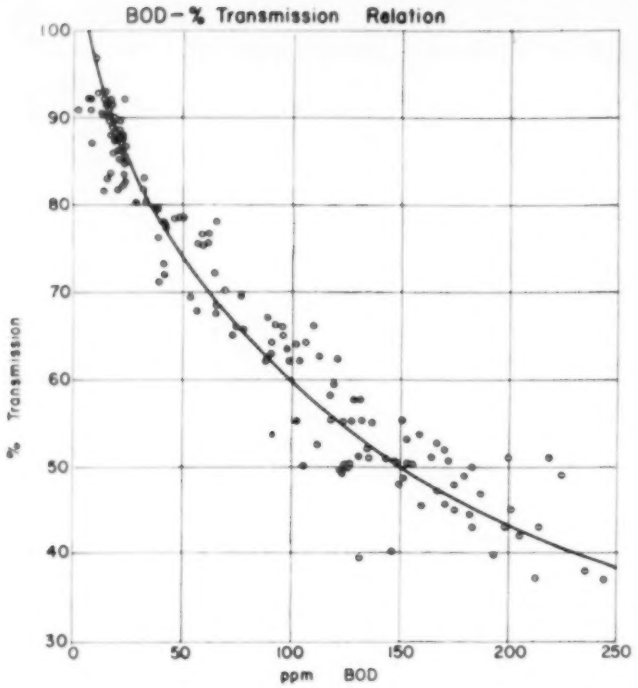


Fig. 3—Ridgewood Pilot Plant Data. Calibration curve illustrating relation between light transmission and B.O.D. values of sewage.

Table II illustrates data from an activated sludge pilot plant. These data relate per cent light transmission to the reduction of B.O.D. and oxygen consumed.

The interdependence of biological activity and the clarification phenomenon indicates that a relation should exist between the sludge and the clarification mechanism. Heukelekian[4] has suggested this to be a relation between the quality of the effluent and the stage of oxidation of the activated sludge. Work at the Ridgewood laboratory has indicated that relationships exist between the per cent light transmission of the effluent and the variable factors in the process.

The lack of a proper environment, as indicated by oxidation-reduction potentials (O-R-P) or other criteria may progressively produce a more turbid effluent. Experimental work has indicated that both insufficient oxygen and a heavy organic loading produce an effluent of increasing turbidity. Pilot plant studies revealed that a consistent effluent quality could be maintained only so long as oxidative conditions were present in the activated sludge-sewage mixture. The continued absence of dissolved oxygen resulted in a decrease in the effluent light transmission value in each case investigated. When this condition obtained, the rates of hydrolysis and oxidation appeared unable to keep pace with the rates of loading; hence the rate of removal decreased. In test runs the air applied to the activated sludge process was maintained high in case A and low in case B; a lower light transmission reading resulted in case A under a similar imposed loading.

A theory proposed by several other investigators, which appears logical on the basis of work done here and elsewhere, holds that when the load of organic materials present in domestic sewage is continuously applied to a biological sludge mixture in the presence of air, the organic materials are transferred to the sludge where they are subsequently hydrolyzed and oxidized. Hydrolysis must occur in order to make the material available to the organisms. This condition results in an increase in per cent light transmission of the liquor as compared to that of the applied raw sewage. The sewage colloids are thus precipitated during the aeration period[5].

The per cent light transmission of the applied load may be sufficiently high (and hence the oxygen demand may be inversely low) to maintain hydrolysis and oxidation rates proportional to the load with respect to time; then the sludge is in a proper zone of biological activity and a high light transmission value will be maintained in the process effluent. When the loading exceeds the biological activity limits of the sludge with respect to time, a general deterioration of the sludge occurs. This results in an adverse biological environment and a depressed light transmission in the effluent.

Investigators[5] have found that saturating the sludge beyond its limits with sewage colloids impairs clarification. Further additions of sewage under this condition will result in no further activity and hence in no clarification. A sludge can consistently purify a definite quantity of raw sewage solids, but an excess is not readily oxidized. A saturated sludge will likewise have a higher oxygen absorption rate. The foregoing characteristics have been indicated in some treatment units in which a high effluent light transmission was produced during the night and early morning hours of weak loading and a low relative effluent light transmission was produced by the heavy loading during the day. The photometric method may apply to the relative light transmission depression of sludge liquor when sludge has deteriorated in a clarifier or holding tank. This concept is in general accord with the findings of Haseltine[6], who believes that biological oxidation should be regulated to keep pace with adsorption during the aeration period.

Hence, the variables directly affecting the light transmission of a sewage effluent in relation to the light transmission of the raw sewage loading are the biological quality of the sludge, the quantity of sludge, the applied air, and the applied loading; all with respect to time. For each plant under consideration, the balance required to produce an effluent of high light transmission is a function of the above mentioned variables and will depend upon the character of the sewage, recirculation rates, applied air, detention times in the various units, etc. Therefore, with respect to time, changes in per cent light transmission of an effluent are indicative of the changes in the character of the sludge with respect to its ability to remove the applied sewage colloids.

To illustrate the above, when the light transmission of the process effluent decreased, it was found necessary to change the applied air or to vary the quantity of sludge recycled.

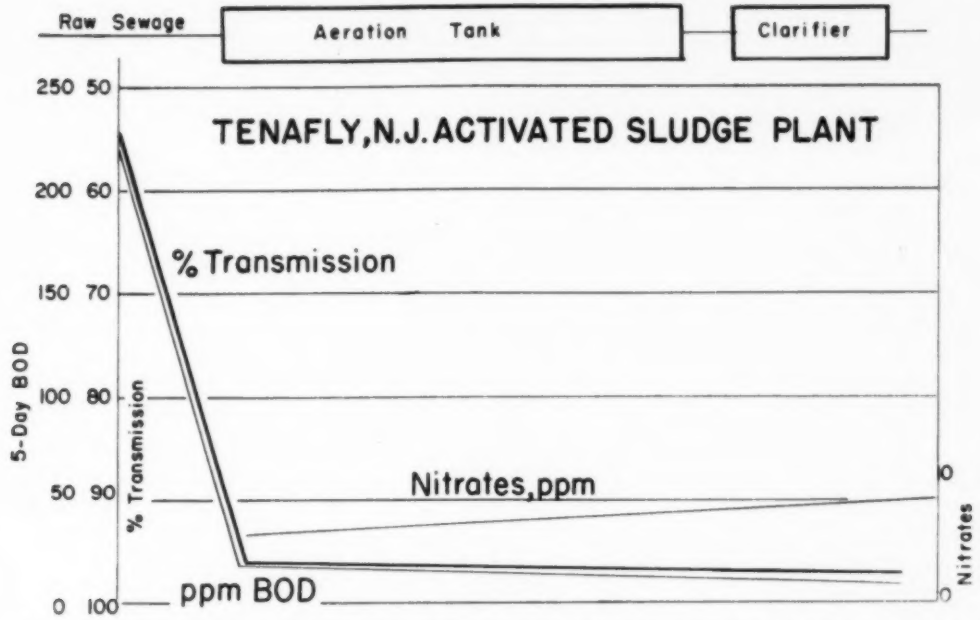


Fig. 4—Tenafly, N. J., Activated Sludge Plant. Relation between treatment units, light transmission values and sewage characteristics.

Light transmission is used as a rapid indicator of potential process failure. The photometric method may indicate over-oxidation and dispersion; it may indicate the necessity to increase the quantity of air or the quantity of recycled sludge to maintain an oxidative level proportional to the applied load.

For example, in activiated sludge pilot plant operations at Ridgewood, a reduction in per cent light transmission of the effluent could usually be traced to a failure in the treatment process caused by sludge deterioration, lack of air, etc. In one instance, when the light tranmission of the effluent substantially decreased, investigation revealed a clogging of the final clarifier transfer lines with resulting decomposition of the sludge blanket. Correction of this condition promptly restored the clarity of the effluent. Fig. 5 is a plot of 24 hours of operating data from the pilot plant, illustrating light transmission values of the applied raw sewage and of the process effluent.

In contrast to the above example, overaeration and overoxidation of sewage produced by under loading in the presence of appreciable dissolved oxygen caused a redispersion of the sludge floc. This condition produced a turbid effluent and hence a decrease in the per cent light transmission. Continued areation of a sludge beyond the normal purification period resulted first in a large increase in the ammonia content in the liquor, apparently due to sludge decomposition, and in a progressively lower light transmission. Aeration beyond this period produced 40 to 60 ppm. of nitrates in the liquor, but usually resulted in an appreciable decrease in the per cent light transmission. This condition may be construed to be on the upper side of the biological balance.

Biological Filtration

The extension of this measurement to biological filtration processes has revealed that high light transmission values in the effluent from an oxidative system are concordant with high B.O.D. reductions. The zooglea film of the biological filter is analgous both to activated sludge (which purifies by use of a similar material) and to chemical precipitation processes (the filter coagulates colloidal matter and agglomerates fine particles in much the same manner[3]). There is a direct analogy between the condition of the activated sludge particle and the filter film with respect to their ability to clarify and oxidize the applied polluting material. Excessive loadings progressively deteriorate the filter film and produce decreased transmission in the effluents. Recognition of this condition, which existed at the Ridgewood sewage treatment plant some years ago, resulted in the development

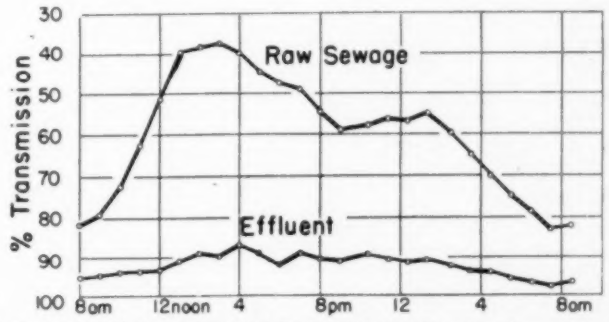


Fig. 5—Activated Sludge Treatment. Variation in light transmission values of raw and treated sewage over a 24-hour operating cycle.

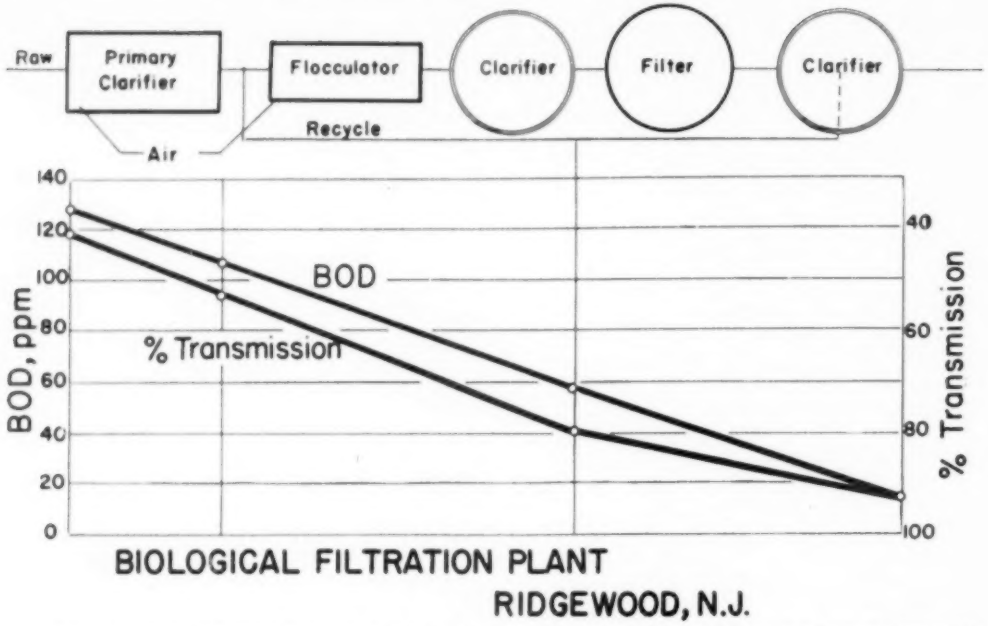


Fig. 6—Ridgewood, N. J., Biological Filtration Plant. Relation between treatment units, light transmission values and sewage characteristics.

of controlled clarification in the preceding units whereby increases in light transmission of from 51.5 to 79.5 per cent were effected. These changes had the further effect of enhancing the biological filter performance and of producing final effluents having up to 97.5 per cent light transmission.

The effect of temperature on filter efficiency is also revealed by per cent light transmission. In winter operation at Ridgewood, the light transmission of the filter effluent was considerably lower than in summer operation. Likewise, the B.O.D. reflected similar variation. When oxidation and deflocculation are excluded, the performance of the Ridgewood plant in terms of reduction in oxygen demand can readily be measured by per cent light transmission. Fig. 6 illustrates the light transmission changes at the Ridgewood sewage treatment plant. A considerable portion of the B.O.D. reduction accomplished by filtration and post sedimentation is attributed to flocculation of the colloids by the filter, particularly at high rates of application[6, 7].

The performance of several high-rate filtration plants was evaluated by light transmission measurement and the results were found to correlate with oxygen demand reductions. Hence, in many biological filtration plants treating sewage, it appears that an approximation of the effluent quality and loading characteristics can be readily obtained from transmission measurements.

Transmission Test

Apparatus:

Photo-electric colorimeter, absorption cells (20 mm. depth or equivalent), 440 u or blue glass filter.

Procedure:

The instrument is standardized to 100 per cent transmission with distilled water or city water. The sample to be measured is then placed in a suitable cell, the cell is placed in the instrument, and the per cent light transmission of the sample read directly.

In order to change per cent light transmission readings to concentration units, B.O.D. or some similar measurement may be used. A calibration curve is obtained by running B.O.D. and per cent light transmission values on enough samples of varying strength to yield a good curve. From this, all subsequent transmission readings may be converted directly to ppm. B.O.D.

According to Lambert's Law the light transmission will vary as the depth of the light path. Hence, the choice of sample receptor depth will depend upon the degree of turbidity (or color) exhibited by the sample. In studying normal domestic sewage, a cell depth of 15-20 mm. is generally adequate over the operating range, and yields light transmission values from 30 to 95 per cent. For a less turbid waste a greater cell depth should be used, and for a more turbid waste a lesser cell depth.

Summary and Conclusions

This paper deals with the application of a rapid method of estimating the process efficiency and effluent quality of sewage treatment systems. The measurement of light transmission values has been found to approximately correlate with B.O.D. and oxygen consumed values at the Ridgewood, N.J., sewage treatment plant. The results apply to biological filters and activated sludge process units. In several plants investigated, the increase in per cent light transmission roughly corresponded to the B.O.D. reduction. The light transmission results were also found to show a relationship to other process variables. Possibilities exist of applying this method to stream surveys for locating sewage outlets, pollution zones, etc.; and to continuously measuring and recording raw sewage strength or effluent quality by means of a photo-electric cell.

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Plastic Casing Facilitates New Well Drilling Technique

New packaged-unit rig speeds drilling and casing water wells.

Carlon Products Corporation participated in a recent demonstration in which a 61-foot water well was drilled, cased, piped and pumped in a total elapsed time of 125 minutes. Three men utilizing a new drilling technique accomplished this feat near Washington, D.C., before an audience of military observers, representatives of government agencies and other interested persons.

This remarkable demonstration was made possible by a packaged-unit portable drilling rig which consists of a 4-wheel-drive one-ton Willys-Overland pickup truck, a special rig made by Mobile Equipment, Inc. and 5-foot sections of lightweight Carlon plastic casing. This combination unit has been developed, through close cooperation of the interested companies, to facilitate the installation of complete water wells in a fraction of the time normally required.

NEW drilling technique and utilization of plastic well casing.

The hole is drilled to sufficient depth by means of augers. Several sections of Carlon casing are quickly joined and attached to a special perforated well screen that has an expendable bit on one end. The screen and casing then are lowered manually into the hole part way until the top section of casing extends approximately two feet above ground level. A rotary driving rod consisting of 5-foot sections is lowered into the casing and connected to the bit on lower end of screen. Subsequently, a length of casing is slipped over the driving rod and joined by means of a cemented sleeve to the casing extending above ground level. Driving rod is then attached to the power source and screen and casing are "pushed" into the well approximately five feet. The expendable bit's reaming action cleans out the hole and reopens it in the event of collapse. This same procedure is repeated by adding new sections of casing and rotary driving rod until the screen reaches well bottom. If the last section of plastic casing extends too high above surface level, it can be cut off easily with an ordinary handsaw.

After the well is cased, the driving rod is disconnected from the bit and pulled out. Lengths of flexible or rigid plastic pipe then are lowered into the well, and a pump is attached. In the pictured demonstration, rigid pipe in random 10-foot lengths was utilized, and sections were joined by cemented sleeves. The special cement used for both casing and pipe joints sets with sufficient bond in two minutes to permit lowering of new section into well.

The plastic casing is a vital component in this new packaged drilling rig because its extreme light weight and simplicity of connection provide for easy manual handling and rapid installation. In addition, it is unaffected by the action of corrosive waters or soils and is immune to scale, rot, rust and electrolytic corrosion. The producers of Carlon plastic pipe and casing guarantee the product to contain no harmful or toxic ingredients that might contaminate the water.

The new well drilling equipment described above can penetrate shale, slate, sandstone and limestone, but it is not suitable for drilling through solid hard rock. It is reported that in several preliminary drilling experiments with this packaged unit rig, wells almost 100 feet deep have been drilled in less than two hours.

An Objection from India

And, a Legitimate One!

Writes R. S. Mehta, Chief Engr. and Manager of the Delhi (India) Joint Water and Sewer Board, taking justified exception to a statement concerning the water supply situation in New Delhi, India, that appeared in an article published in the June, 1951, issue of this magazine.

On page 254 of the article "WATER—Mysterious; Common; Strange; Destroying; Vital," appears the statement—"New Delhi is the capital of India . . . one might suppose that its people enjoy an ample water supply. On the contrary, thousands of natives in New Delhi stand in line while waiting to fill water jars with the precious fluid. How different it is in our American cities!"

Engr. Mehta is justifiably distressed that Americans can be so badly informed concerning the water supply situation in New Delhi, which is served by a modern filtration and chlorination plant delivering 14 mgd. to the city and ite environs. In addition 20 mgd. of unfiltered water is supplied for use on lawns and gardens. The Joint Water and Sewage Board maintains up to date laboratory control of purification.

We sincerely regret the slip in the editing of the article referred to which permitted such an inaccurate statement to remain in the article. We are now apologizing to one and all who may have been adversely affected by the misstatement. In the end we will be the beneficiary, however, because Engr.-Mgr. Mehta, an American trained engineer from Cornell and M.I.T., has offered to prepare for publication an article describing the water works of New Delhi and its operation.

THE EDITOR'S COMMENTS

Fluoridation Receives A.M.A. & N.R.C. Endorsement

Two things have happened recently to advance the status of water fluoridation in the lay mind and to create even a more widespread desire on the part of the public to have fluoride treatment of water for the protection of the teeth of the community's children.

One of these two happenings is the release by the National Research Council of the report of its special Committee on Fluoridation of Public Water Supplies. This far-reaching report by scientific men of high standing in their professions endorses water fluoridation as a measure which is both effective and safe. The other happening is the issuance officially of a long-awaited opinion from the medical fraternity which has now openly voiced its opinion on fluoridation for the first time. The American Medical Association, which we once questioned concerning its silence on water fluoridation, has released a joint statement by its Council on Pharmacy and Medicine and its Council on Foods and Nutrition. In substance this statement constitutes an official A.M.A. endorsement of fluoridation: to wit—

"The Council on Pharmacy and Chemistry and the Council on Foods and Nutrition of the American Medical Association have been requested to state their opinion regarding the safety of fluoridation of water supplies, a procedure which now has been adopted by more than 140 cities.

The Councils are unaware of any evidence that fluoridation of community water supplies up to a concentration of one part per million would lead to structural changes in the bones or to an increase in the incidence of fractures. The only difficulty so far revealed is a possible increase in mottling of the tooth enamel. From the available evidence based on thousands of observations the incidence of mottling of the enamel in children who drink water containing fluoride up to a concentration of one part in a million is minimal and detectable only by careful dental examination. It occurs only in a small percentage of children and is so slight as not to present a problem from the point of view of appearance or strength of the teeth. Evidence of toxicity other than the effect on enamel has not been reported in communities where the water supply has several times this concentration. *After considering the evidence available at this time, the Councils believe that the use of drinking water containing up to 1 part per million of fluoride is safe.*"

[The italics in the statement are ours.—Ed.]

Considering now the report of the special committee of the National Research Council, some of the points emphasized in the "Summary & Conclusions" are these:

1—Fluoridation should be considered by any community which includes a child population of sufficient size, and which obtains its water supply from sources which are free from or extremely low in fluorides. (And, might we add, where the child population is *not* receiving an adequate protective fluoride diet from other sources.—Ed.)

2—The actual reduction in dental caries will vary according to local conditions. The widely quoted figure of 65 percent reduction can only constitute a prediction applying to communities whose water contains little or no natural fluorides. Benefits in many cases might be much less, depending upon the *total* fluoride intake of the child population from *all* sources.

3—Protection is gained chiefly by drinking fluoride-containing water while the permanent teeth are being formed, or up to about twelve years of age. However, all indications are that this protection extends into adult life.

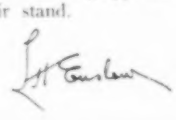
4—There is no evidence that fluorides are harmful in the very small amounts (about one part in a million) needed to reduce caries. It is estimated that perhaps five million Americans drink water with this much fluoride content, or more, every day. However, water fluoridation should be undertaken only with expert dental and engineering supervision by public health agencies, with constant chemical control.

Dr. Kenneth F. Maxcy, Professor of Epidemiology at Johns Hopkins University, Baltimore, Md., served as chairman of N.R.C.'s special Committee on Fluoridation. The membership includes Dr. J. L. T. Appleton, Professor of Microbiology and former Dean, School of Dentistry, Univ. of Pennsylvania; Dr. Basil G. Bibby, Director, Eastman Dental Dispensary, Rochester, N.Y.; Dr. H. Trendley Dean, Director, National Institute of Dental Research, U.S.P.H.S., Bethesda, Md.; Dr. A. McGehee Harvey, Professor of Medicine, The Johns Hopkins University; Dr. Francis F. Heyroth, Associate Professor of Industrial Toxicology and Assistant Director, Kettering Laboratory, University of Cincinnati, Ohio; Dr. A. LeRoy Johnson, Great Barrington, Mass., former head of the Harvard School of Dental Medicine, and Dental Consultant to the National Research Council; Harold A. Whittaker, Professor of Public Health Engineering, University of Minnesota; and Dr. Abel Wolman, Professor of Sanitary Engineering at Johns Hopkins University, past-president of the Am. Water Works Ass'n. and the Am. Public Health Ass'n., and generally recognized as an authority on the water supply and public health fields.

We have listed the committee membership because of its impressiveness. Those who in 1950 heard Dr. Appleton, at the time Dean of the School of Dentistry at the Univ. of Penna., present his widely circulated discussion before the Am. Water Works Ass'n., will recall his reluctance to accept water fluoridation at that time, and his strong advocacy of a policy of "watchful-waiting" by water works authorities to see how effective the process would prove to be in operations already started before jumping into widespread fluoridation. And, it will be recalled, that Dr. Wolman was far from being a fluoridation enthusiast when he spoke on the topic before the Am. Water Works Ass'n. in San Francisco. At the time (1947) fluoridation was in its infancy of course. It is to the credit of both of these men of distinction, with voices carrying much weight, that they can change their minds when accumulated evidence and time proves them wrong.

Back in 1947 this writer and the profession as a whole was just as opposed to water fluoridation, thinking it to be an opening wedge to possible socialistic mass-medications of various sorts through the medium of public water supplies. Like the short lived trials some years previously of iodine treatment of the public water supply for the suppression of goiter, these would likely be found a more practical, more effective and less expensive way of controlling dental cavities through some other adaptation of fluorides, if not some even more beneficial remedy.

Considering developments of the past five years, now strengthened by the open endorsement of fluoridation by all important dental, medical and public health organizations, it appears to this writer that water supply authorities now opposing fluoridation, and the one or two public health agencies that are withholding approval can ill afford to continue in their stand.



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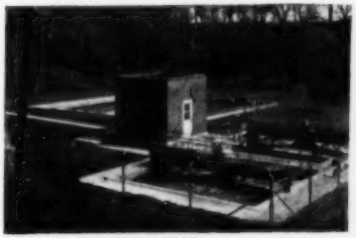

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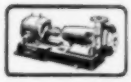

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Meetings Scheduled

Jan. 15, 1952—New York, N.Y. *(Hotel Park, Sheraton)*
NEW YORK SECTION A.W.W.A. (Winter Luncheon Meeting) Sec'y, R. K. Blanchard, 50 West 50th Street, New York, N.Y.

Jan. 17-18—New York, N. Y. *(Statler Hotel)*
NEW YORK SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, Ralph C. Sweeney, State Board of Health, 21 No. Broadway, White Plains, N.Y.

Jan. 17—Boston, Mass. *(Hotel Statler)*
NEW ENGLAND WATER WORKS ASSN. (Monthly Meeting). Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston, Mass.

Feb. 13-15—Indianapolis, Ind. *(Lincoln Hotel)*
INDIANA SECTION A.W.W.A. Sec'y, Geo. G. Fassnacht, 1330 W. Michigan St., Indianapolis 7, Ind.

Feb. 28-Mar. 1—Chicago, Ill. *(Drake Hotel)*
AMERICAN CONCRETE PIPE ASSOCIATION. (44th Annual Convention.) Mgn. Dir., Howard F. Peckworth, 228 N. LaSalle St., Chicago, Ill.

Mar. 9-13—College Station, Texas *(Texas A. & M. College)*
TEXAS WATER & SEWAGE WORKS ASSOCIATION. Sec'y, V. M. Ehlers, 501 West 33rd St., Austin, Texas.

Mar. 12-14—Atlantic City, N.J. *(Hotel Traymore.)* N.J. SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Secy.-Treas. Michael S. Kachorsky, Box 766, Manville, N.J.

Mar. 24-26—Augusta, Ga. *(Bon Air Hotel)*
SOUTHEASTERN SECTION A.W.W.A. Sec'y, T. A. Kolb, State Board of Health, Wade Hampton Building, Columbia, S.C.

Mar. 26-28—Chicago, Ill. *(Hotel LaSalle)*
ILLINOIS SECTION A.W.W.A. Sec'y, J. L. Hart, 122 So. Michigan Ave., Chicago 3, Ill.

Apr. 3-5—Mesa, Arizona *(Maricopa Inn)*
ARIZONA SEWAGE & WATER WORKS ASSOCIATION (and) ARIZONA SECTION A.W.W.A. Sec'y, H. S. Jordan, State Dept. of Health, Phoenix, Ariz.

Apr. 7-9—Fayetteville, Ark. *(University of Arkansas, Eng. Bldg.)*
ARKANSAS WATER & SEWAGE CONFERENCE. Dr. Harrison Hale, Southern State College, Magnolia, Ark.

Apr. 10—Billings, Mont. *(Northern Hotel)*
MONTANA SEWAGE & INDUSTRIAL WASTES ASSN. Sec'y, H. B. Foote, State Dept. of Health, Helena, Mont.

Apr. 11-12—Billings, Mont. *(Northern Hotel)*
MONTANA SECTION A.W.W.A. Sec'y, A. W. Clarkson, State Board of Health, Helena, Mont.

Apr. 16-18—Syracuse, N.Y. *(Hotel Syracuse)*
NEW YORK SECTION A.W.W.A. (Spring Meeting). Sec'y, R. K. Blanchard, 50 West 50th St., New York, N.Y.

Apr. 17-18—Lincoln, Neb. *(Cornhusker Hotel)*
NEBRASKA SECTION A.W.W.A. Sec'y., E. Bruce Meier, University of Nebraska, Lincoln, Neb.

Apr. 22-26—Spokane, Wash. *(Hotel not decided)*—tentative
PACIFIC NORTHWEST SECTION A.W.W.A. Sec'y, O. P. Newman, Boise Water Corp., Boise, Idaho.

May 4-9—Kansas City, Mo. *(Municipal Auditorium)*
AMERICAN WATER WORKS ASSOCIATION (Annual Convention). Exec.-Sec'y, Harry E. Jordan, 521 Fifth Avenue, New York 17, N.Y.
(Accommodations in 14 hotels. Reservations through A.W.W.A. office.)

(Continued on page 80A)

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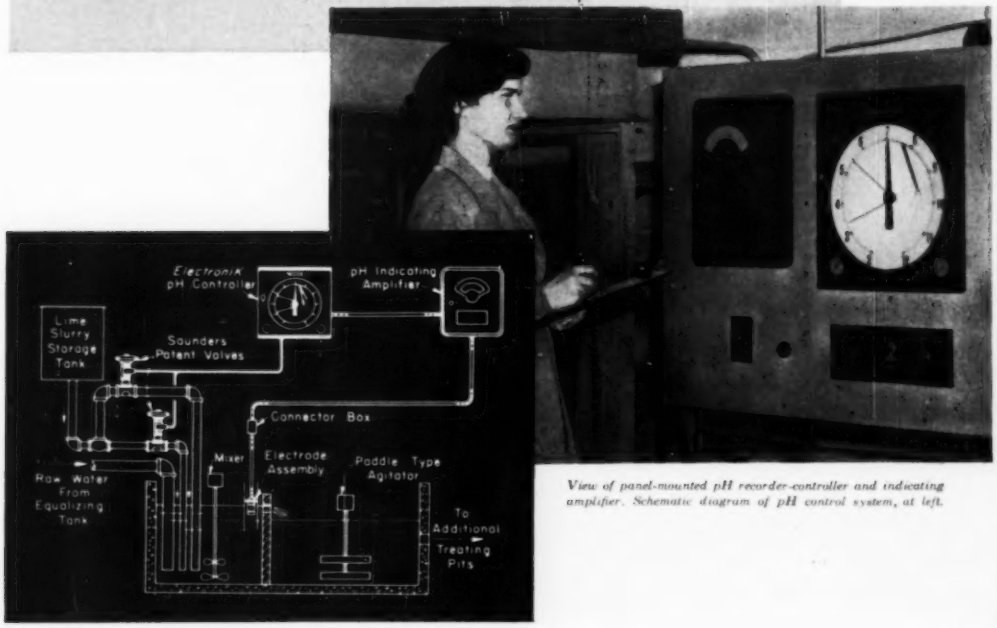

View of panel-mounted pH recorder-controller and indicating amplifier. Schematic diagram of pH control system, at left.

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Meetings Scheduled

(Continued from page 78A)

May 12-13—Roanoke, Va. *(Hotel Roanoke)*
VIRGINIA INDUSTRIAL WASTES & SEWAGE WORKS ASSN. Sec'y, G. R. Talcott, 815 E. Franklin St., Richmond 19, Va.

May 26-28—Montreal, Canada *(Hotel Mt. Royal)*
CANADIAN SECTION A.W.W.A. Sec'y, Dr. A. E. Berry, Ontario Dept. of Health, Parliament Building, Toronto, Ont.

June 18-20—Erie, Pa. *(Lawrence Hotel)*
PENNSYLVANIA SECTION A.W.W.A. Sec'y, L. S. Morgan, State Dept. of Health, Greensburg, Pa.

Aug. 25-27—State College, Pa. *(Nittany Lion Inn)*
PENNSYLVANIA WATER WORKS OPERATORS ASSN. Sec'y, R. Rupert Kountz, Pennsylvania State College, State College, Pa.

Aug. 27-29—State College, Pa. *(Nittany Lion Inn)*
PENNSYLVANIA SEWAGE & INDUSTRIAL WASTES ASSN. Sec'y, B. S. Bush, Dept. of Health, Kirby Health Center, Wilkes Barre, Pa.

Sept. 3-5—Upper Saranac, N.Y. *(Saranac Inn)*
NEW YORK SECTION A.W.W.A. Sec'y, Rollo K. Blanchard, 50 West 50th St., New York, N.Y.

Sept. 8-13—Chicago, Ill. *(Hotels to be announced)*
AMERICAN SOCIETY OF CIVIL ENGINEERS. (Centennial Celebration). Sec'y, Wm. N. Carey, 33 West 39th St., New York, N.Y.

Sept. 15-17—Knoxville, Tenn. *(Andrew Johnson Hotel)*
KENTUCKY-TENNESSEE SECTION A.W.W.A. Sec'y, R. P. Farrell, Dept. of Public Health, 420—6th Ave., Nashville, Tenn.

Sept. 16-17—Cheyenne, Wyo. *(Frontier Hotel)*
ROCKY MOUNTAIN SECTION A.W.W.A. Sec'y, Geo. J. Turre, Box 600, Denver, Colo.

Sept. 18-19—Cincinnati, Ohio
OHIO SECTION A.W.W.A. Sec'y, F. P. Fischer, 812 Perry Payne Bldg., Cleveland 13, Ohio.

Sept. 23-25—Atlantic City, N.J. *(Madison Hotel)*
NEW JERSEY SECTION A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

Sept. 24-26—Battle Creek, Mich. *(Post Tavern)*
MICHIGAN SECTION A.W.W.A. Sec'y, T. L. Vander Velde, Dept. of Health, Lansing 4, Mich.

Oct. 6-9—New York, N.Y. *(Statler Hotel)*
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSOCIATIONS (Annual Meeting). Exec.-Sec'y, W. H. Wisely, 325 Illinois Bldg., Champaign, Ill. (and) NEW YORK SEWAGE & INDUSTRIAL WASTES ASSOCIATIONS. Sec'y, Ralph C. Sweeney, 21 N. Broadway, White Plains, N.Y.

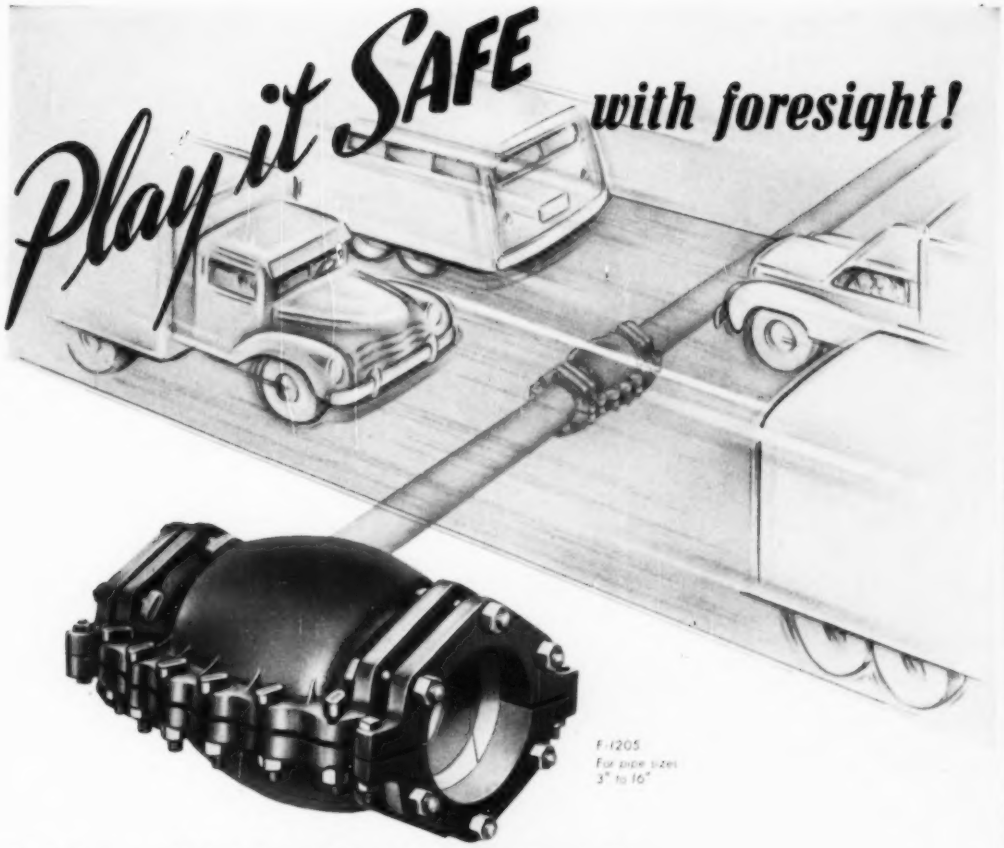
Oct. 12-15—Tulsa, Okla. *(Mayo Hotel)*
SOUTHWEST SECTION A.W.W.A. Sec'y, L. A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

Oct. 14-17—Atlantic City, N.J. *(Chalfonte Hotel)*
PENNSYLVANIA WATER WORKS ASSOCIATION. Sec'y, W. A. Kufs, 510 Telegraph Bldg., Harrisburg, Pa.

Oct. 23-25—Mason City, Iowa *(Hanford Hotel)*
IOWA SECTION A.W.W.A. Sec'y, H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.

Oct. 28-31—Pasadena, Calif. *(Huntington Hotel)*
CALIFORNIA SECTION A.W.W.A. Acting Sec'y, Lee Streicher, Metropolitan Water District, 545 Cloverleaf Way, Monrovia, Calif.

Oct. 29-31—Washington, D.C. *(Wardman Park Hotel)*
CHESAPEAKE SECTION A.W.W.A. Sec'y, Carl L. Lauter, 6955 33rd St., Washington, D.C.



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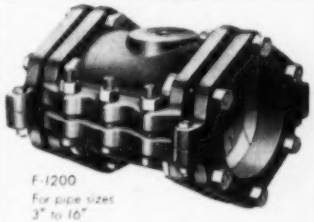

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Here's That Man Again—And now that Thanksgiving vacation is over and our son, Jimmy, has gone back to school, I've returned to my attic to get on with the business of keeping my typewriter smoking.

* * *

First off—Apologies are in order: In the November issue of this column, I ran a picture of the officers of the Illinois Section of AWWA and—woe is me—I didn't recognize one of the men in the photograph. Well, Les Hart, U. S. Pipe's Chicago boy and Secy. of the Ill. Section, informed me pronto—as did Lindy (Omega) Harper, who furnished the photo.

Is my face red—the little man between Les Hart and Cliff Moomau is none other than the Director from the Ill. Section, Fred Gordon, Asst. City Engr. of the City of Chicago. Fred is a big wheel in the design of the new Chicago Central District Water Purification Plant, which will be about four times as large as any other in the world—And I didn't recognize him—Ah, woe is me! ! !

* * *

I'm happy to report that once again I am back in good graces with the Wisconsin AWWA Beanie Club, having rightfully placed Art Kuranz in Waukesha in my November column, after wrongfully placing him in Kenosha in September. Art has forgiven me, but I haven't yet heard from Tom Hay of Kenosha or those erstwhile Kenoshans, Jimmy Myers, now of Philadelphia Suburban Water Co., and Ted Rudgal, now manager of the Gary-Hobart (Ind.) Water Co.

Art also wished me well in my new free lancing and consulting efforts, and what pleased me more, said he hoped I wouldn't ever give up writing this column.—Hmmmm—Thanx!

* * *

In August, I went to the famous annual meetings at State College, Pa. —naturally—for the Pa.WWOA and Pa.S&IWA gatherings. There are several things I want to say about those sessions and here are a few:

R. Rupert Kountz, Prof. of San. Engr. at Penn State is Secy. of Pa.WWOA and if no one remembers him for anything else, he should go down in history as the fellow who takes the trouble to hand-letter each registrant's breastpocket card, in letters large enough to read. More power to him!

Roy Evans, Vice Pres., Mueller Co., was beaming as he accepted congratulations for having at last beaten Karl Mann, the publisher, in a round of golf, after trying for ever so long.

Ted Kain, who says his "haderdashery and voice are both easily heard at any convention," was not around this year, having just taken on a sales engineering job with A. P. Smith Co.

The meetings at State College were held in the TUB—No Comment!

Ray (Mr. AWWA, Jr.) Faust spoke on Operators' Licensing and called attention of the audience to the fact that his accent had wandered a little away from Pennsylvanian since he left Penn State some years back on his way to New York City by way of Lansing, Mich.

(*Continued on page 84A*)

You're burying your money's worth . . .

when you specify

WARREN

CAST IRON PIPE

"Built To Be Forgotten"

You can be **sure** you get 100 cents to the dollar when you plan your piping system around **WARREN** Cast Iron Pipe and **WARREN** Cast Iron Fittings.

WARREN Cast Iron Pipe is produced in all sizes from 2" to 84" with all types of joints . . . fittings in numerous non-standard patterns to meet unusual requirements.

Warren **FOUNDRY & PIPE CORP.**

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Bell & Spigot Pipe • Flange Pipe • Mechanical Joint Pipe

Flexible Joint Pipe • Short Body Bell & Spigot Specials

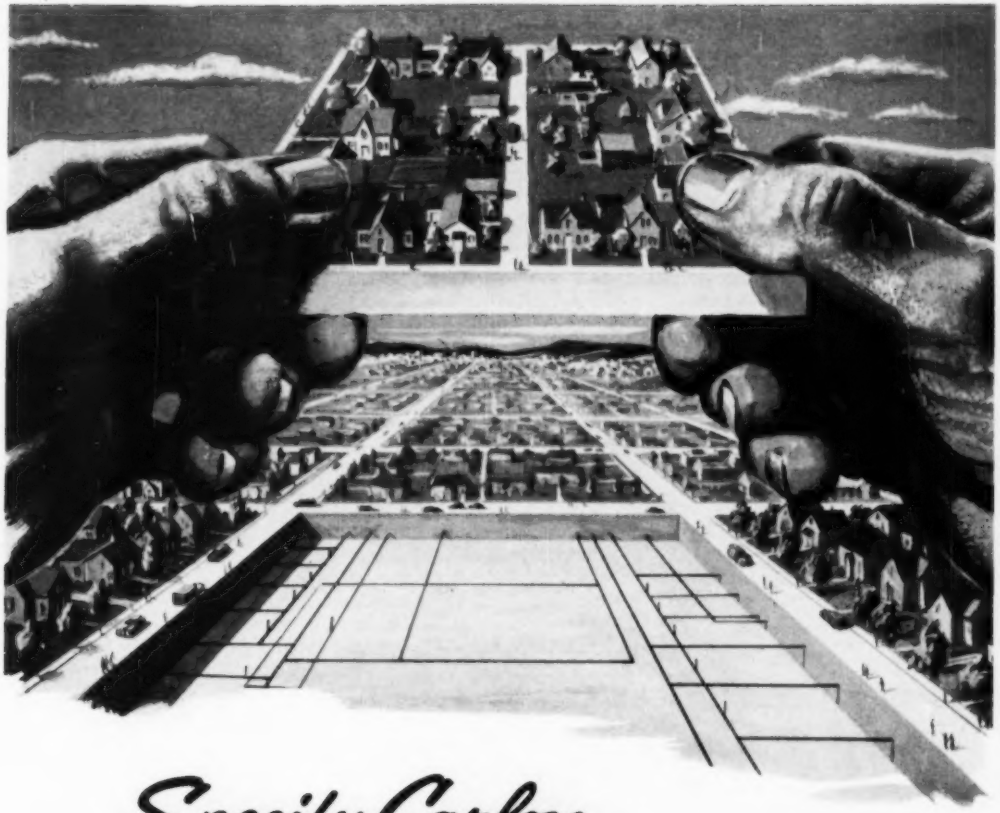
WARREN PIPE CO. OF MASS. INC. 75 FEDERAL ST. BOSTON, MASS.

STRENGTH . . . TOUGHNESS

RESILIENCY . . . MEAN

MAXIMUM LIFE!

95 Years of Continuous Service



Specify Carlon...

FOR LONGER PIPE LIFE

Combining the inherent advantages of plastic with the desirable characteristics of metal, CARLON plastic pipe is the superior new medium for fluid and gas transmission. Whether used for municipal water systems, sewage disposal, land drainage or other medium-pressure low-temperature applications, it assures more years of dependable, trouble-free service than ordinary pipe.

CARLON is absolutely guaranteed against rot, rust and electrolytic corrosion . . . is inert to the chemical action of corrosive waters and soils . . . and will not accumulate scale or sediment. It features light weight (only ⅛ as much as steel), flexibility, and ease of installation.

CARLON plastic pipe can be installed quickly without special tools or materials handling equipment. It is furnished in long lengths which require a minimum number of fittings. A complete line of molded plastic fittings is available for joining lengths of CARLON or for connecting this new pipe with previously installed metallic systems.

Specify the Pipe with the Stripe!

CARLON CP

CARLON PRODUCTS CORPORATION

IN CANADA: MICRO PLASTICS, LTD., ACTON, ONTARIO

10300 MEECH AVENUE • CLEVELAND 5, OHIO

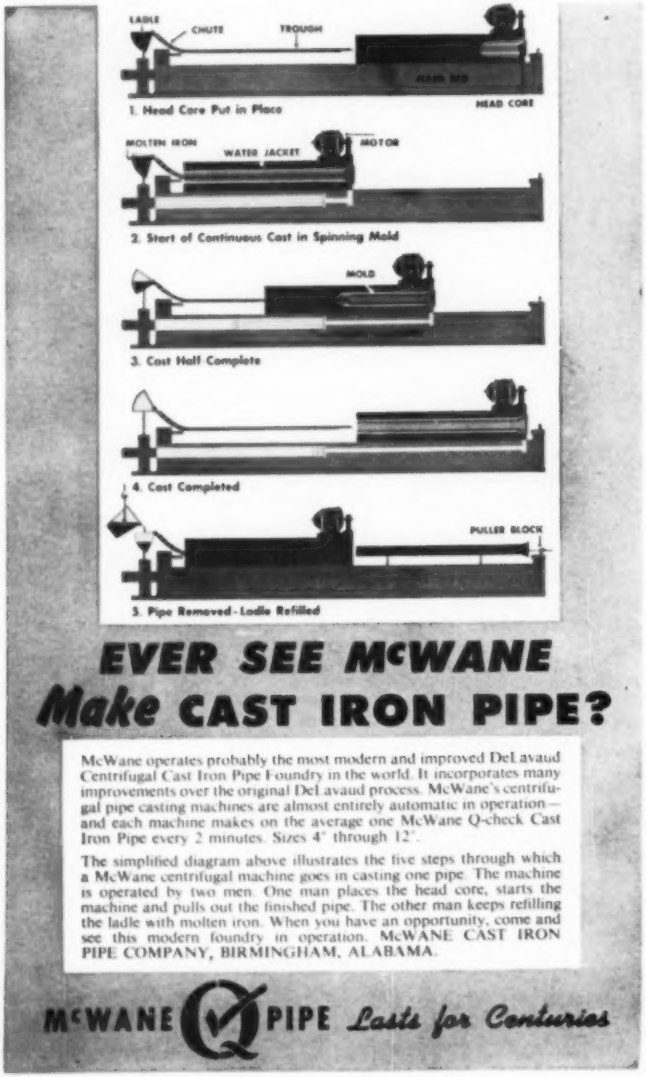
(Continued from page 82A)

Heard the other day that Col. Jack J. Hinman, Jr., expects to be back in Iowa City, Iowa, about April 1st and hopes to make the AWWA Convention in Kansas City. He should have some good yarns about his tenure as Superintendent, Perito Tecnico, Auga Potable de Guayaquil, Ecuador, S.A.

* * *

Small World No. 14—Back in my college days, I was editor of my fraternity house organ. Imagine my surprise then to discover that our son, Jimmy, was made editor of his fraternity house organ at Cornell University. But that surprise really became a small world item when I read the latest issue of the *Traveller* of Acacia Fraternity at Cornell and discovered the following news item—"William L. Havens—'15, writes that he is still in the engineering business . . . 'Bill's' address is 1140 Leader Bldg., Cleveland, Ohio."

I'll say "Bill" is still in the engineering business—As part of the firm of Haven and Emerson, one of his latest accomplishments is the beautiful new Nottingham Filter Plant at Cleveland, Ohio.



EVER SEE McWANE Make CAST IRON PIPE?

McWane operates probably the most modern and improved DeLavaud Centrifugal Cast Iron Pipe Foundry in the world. It incorporates many improvements over the original DeLavaud process. McWane's centrifugal pipe casting machines are almost entirely automatic in operation—and each machine makes on the average one McWane Q-check Cast Iron Pipe every 2 minutes. Sizes 4" through 12".

The simplified diagram above illustrates the five steps through which a McWane centrifugal machine goes in casting one pipe. The machine is operated by two men. One man places the head core, starts the machine and pulls out the finished pipe. The other man keeps refilling the ladle with molten iron. When you have an opportunity, come and see this modern foundry in operation. McWANE CAST IRON PIPE COMPANY, BIRMINGHAM, ALABAMA.

McWANE Q PIPE *Lasts for Centuries*

Many of my friends, who were at the Federation Meeting in St. Paul, asked how my new venture was going and I told them that I tried out for one particular assignment at the Federation meeting. Furthermore I was given a contract for future assignments of similar nature. The job is bartender at the cocktail party given by Mrs. Harry E. Schlenz (better known as Norma, the magnificent). The party for the Bd. of Directors and their friends was held on Sunday evening, after the Board meeting.

Without doubt, she is one of the *ne plus ultra* as a hostess, and Harry, who is VeeP of PFT, was a big help to her.—Thanks for the job, kids; it's a pleasure to work for such a grand couple.

* * *

It was also at St. Paul that my good friends from Springfield, Ill., Paul and Olive Troemper (he's Secy. of CSSIWA, and she's an artist), reminded me of the Central States Meeting in Milwaukee. We were all guests of C. C. (W & T) Abplanalp, (better known as Jeff) and I took a picture of C. C. (Springfield) Larson (better known as "Swede"). They asked to see the photograph, so here it is—If you can figure out how it was taken, you're good!

* * *

After the Federation meeting, I spent practically a whole day with W. H. (for Homer) Wisely in the office of the Federation in Champaign. Among other things, we went over the plans for the Federation Meeting in New York in October 1952. And then I went home with "Pete," for one of those wonderful dinners which Hazel always serves.

Before I left that night, Homer showed me a copy of the third edition of "Songs For Men," published by the S.P.A.E.B.S.Q.S.A., Inc. This particular copy was autographed by "Bill" Orchard (W & T), whose composition "Friendship" appears as the last song in the book.

* * *

Wonder how the Harry Krum Invitation Golf Tournament turned out this year. Harry, who has been Chemist at Allentown, Pa., for as long as I can remember, sent invitations to certain persons to come to inspect his

new DeLaval Pumps (Pd. Adv. by Charlie Coleman). It was also suggested that the persons invited should bring golf clubs for a round at Brookside Country Club.

What with Mike Glace, Harry Lendall, John Caton, Lou Klockner, Fred Bush, Jack Radcliffe, Charlie Coleman, and others present, I'll bet those pumps got a whizbang of an inspection.

* * *

At the Providence, R.I., meeting of the N.E. S&IWA, Frank Flood, Partner of Mecalf and Eddy, took over one of the sessions in mid-afternoon for a forum discussion and promptly suggested that everyone stand up and stretch for a moment or two.

A few persons took advantage of the break to slip out and the irrepressible Tom Bowe of Bowe, Albertson, Associates, N.Y.C., spoke up—"You got 'em asleep, Frank; why wake 'em up?"

* * *

Tony Fisher (Dorr Co.) and I are among the many favored (?) Americans who are going to get rich. That is, we shall get rich, if we pay all of the expenses in connection with getting a trunk out of a U. S. Customhouse, somewhere. All we have to do is go to Mexico City, put up the money for "expenses" and we will get one-third of $450,000, which is hidden in a secret compartment of the trunk.

Naturally, the man who wrote to Tony and me (and probably several hundred persons) couldn't sign his name as he is in prison for bankruptcy, but he said that a person who knows me very well and who has spoken very highly of me has led him to trust me with "this delicate matter on which depends the future of his dear daughter as well as his own very existence." I was asked to communicate with Sr. Fabian Villalva, 2 Callejon del Canal 6, int. 4, Mexico City 8, Mexico.

Now, Tony and I don't have time to go to Mexico City and we both are a little short of funds at the moment, what with Christmas and Taxes and all, so if any of you want to be taken in by this, you're welcome. I think I should warn you however, that this looks and sounds suspiciously like the famous old Spanish Swindle, or a reasonable facsimile thereof.

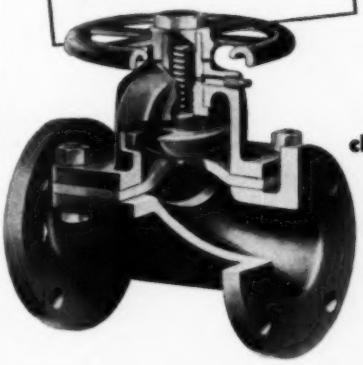
How Tony and I got on the "sucker list" we have no idea. If any of my readers also received a similar letter, I'd be pleased to hear from you.

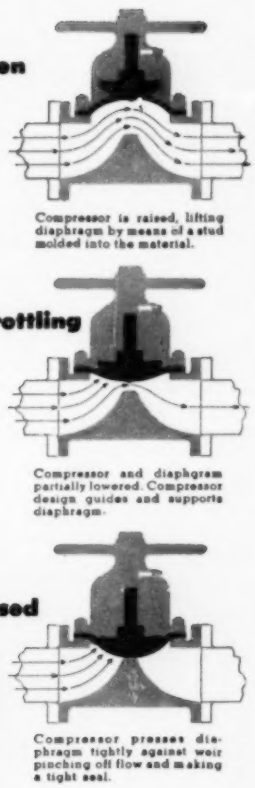
* * *

By the time you read this, it will be too late to wish you a Happy New year, but I do hope that 1952 holds for you, everything that you want.

This Simple Principle

makes HILLS-McCANNA diaphragm valves unexcelled for handling corrosive materials, slurries and semi-solids




open
Compressor is raised, lifting diaphragm by means of a stud molded into the material.
throttling
Compressor and diaphgram partially lowered. Compressor design guides and supports diaphragm.
closed
Compressor presses diaphragm tightly against weir pinching off flow and making a tight seal.

• When it comes to valving hard-to-handle fluids, the simple pinch clamp principle of Hills-McCanna valves (see above) eliminates most ordinary valve troubles. There is no leakage, no packing and material handled cannot contaminate or be contaminated by the working parts. Hills-McCanna Saunders patent diaphragm valves are the answer to many of the most serious valve problems. Write for full details and ask for a copy of Catalog V-48. HILLS-McCANNA CO. 2357 W. Nelson Street, Chicago 18, Illinois.

HILLS-McCANNA
diaphragm valves
saunders patent

Proportioning Pumps
Force-Feed Lubricators · Magnesium Alloy Castings

I also hope that you will all come to the Silver Anniversary Meeting of the Federation in October in New York City. We'll try to make it a big one. Will you help? Better make your plans for Oct. 5-9, now.

V.T.Y.—Doc.

Northeastern University Offers Course in Sanitary Bacteriology

Northeastern University, Boston, Mass., in order to maintain its policy of offering evening graduate engineering courses for professional development for those engaged in the engineering profession, now offers a new course in Sanitary Bacteriology that started in January.

The new graduate course in Sanitary Bacteriology is expected to pioneer a new area of study at Northeastern in civil engineering, particularly for those engineers whose work concerns sanitary engineering problems. The course is also expected to appeal to personnel of the health and safety departments of local municipalities.

A New Method of Combating Water Pollution

A new method of solving lake and stream pollution problems at less than one-third of the cost of present methods was described at the 44th Annual Meeting of the American Institute of Chemical Engineers. Dr. Clyde C. DeWitt, Professor of Chemical Engineering and Director of the Engineering Experiment Station at Michigan State College, told of a new method developed by the Engineering Experiment Station for removing waste and sewage from water before it is returned to lakes and streams.

The new method, adapted from the process used by some paper mills, employs an operation similar to that used in making carbonated beverages, in that it traps air in the waste water under pressure. When the pressure is released, millions of tiny bubbles rush to the surface just as they do when a bottle of soda water is opened. These bubbles carry with them practically every bit of the chemically treated waste material which is suspended in the water, and the water, which is then crystal clear, is allowed to return to a lake or stream.

At present many industries are unable to do a good job of removing waste from the water they use, because many waste products such as oils, very fine metal particles, and fibers will not quickly settle out and are not affected by bacterial action.

Many cities which are faced with the need of expanding their sewage disposal systems may find the new method easier on the taxpayers than the older methods, because less equipment and space are needed.

Air and Water Pollution

Bureau of Public Information, New York University College of Engineering, New York, N.Y., has made available a new 8-page booklet titled **"Research in Air and Water Pollution."**

The new publication describes the work and facilities of the Air and Water Pollution Research Section of the Research Division and is amply illustrated with photos showing wind tunnel tests, balloon high-altitude experiments, radio-active laboratory,

FLEXIBLES "Clean Up" KANSAS CITY UNDERGROUND!

. . . following the Flood Disaster

30 "FLEXIBLE" power bucket machines have been working in the Kansas City flood area since August! This is no doubt America's *all-time-biggest* sewer cleaning job. To aid the stricken area quickly, many cities from as far away as Ohio, Minnesota and Texas made their "FLEXIBLE" equipment available under "FLEXIBLE" supervision, in addition to those immediately supplied by the factory.

America recognizes "FLEXIBLES" with the Red Cross and National Guard as essential in emergencies.

Write for FREE DATA to Dept. W

"FLEXIBLE"

UNDERGROUND PIPE CLEANING CO.
SEWER-ROD EQUIPMENT CO.
9055 VENICE BOULEVARD, LOS ANGELES 34, CALIF.

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801 E. Excelsior Blvd. — Hopkins, Minn.
3786 Durango St. — Los Angeles 34, Calif.
4455 S. E. 24th Street — Portland, Oregon
Francis Hankin — Montreal & Toronto, Can.
351 West Jefferson Blvd. — Dallas, Texas

AMERICA'S LARGEST MANUFACTURER OF PIPE CLEANING TOOLS & EQUIPMENT

air sampling, and health and safety techniques.

Text material is divided into sections and some of the subjects covered are: Effects of Pollution, Industrial Waste Utilization, Meteorology and Aerodynamics, Sanitary Engineering and Sanitary Chemistry, Chemistry and Chemical Engineering, Industrial Medicine and Toxicology, and Industrial Hygiene Laboratory.

Water Pollution Research 1950

Department of Scientific and Industrial Research, Charles House, 5-11 Regent Street, London, S.W.1., has just published the annual report on the work of the Water Pollution Research Laboratory entitled **Water Pollution Research 1950.**

The publication also includes the report of the Director of the Laboratory. Subjects covered in the report include: Under the Sewage heading: Biological Filtration of Sewage, Alternating double filtration, High-rate single filtration, Mechanism of biological filtration, treatment by biological filtration of sewage containing spent gas liquor; Mechanical Filtration of Sewage Effluent; Further Nitrification of Sewage Works Effluent by High-Rate Biological Filtration; and Treatment of Domestic Sewage in Plants Serving Small Groups of Houses.

In discussing Industrial Waste Waters the Manufacture of Paper, Testing of Rocket Motors, and Analysis of Waters Pumped from Coal Mines are covered. The last group of subjects covered are Polluting Effect of Sewage and Industrial Wastes, Toxicity of Substances to Fish and a Survey of the Thames Estuary.

The price of the report is 1s.6d. (40 cents U.S.A.) plus postage.

Authoritative Booklet on Cathodic Protection

National Association of Corrosion Engineers, Houston, Texas, has just published a booklet titled **"Report of the Correlating Committee on Cathodic Protection."**

The report consolidates and revises the four bulletins prepared by the committee to aid in solving the problems created when adjacent underground metallic cables, pipe lines and rail tracks are protected from corrosion by applied cathodic currents.

The committee is composed of representatives of eleven trade and

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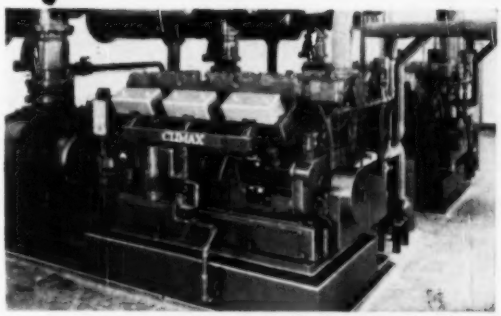
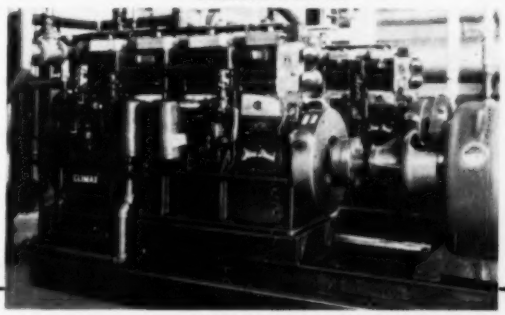


Climax Blue Streak V-120, 195 H.P., 12 Cylinder, V-Type Sewage Gas Engines Direct Connected to Blowers



Climax Blue Streak R-61, 100 H.P., 8 Cylinder, Vertical Sewage Gas Engines Direct Connected to Pumps. Both Installations in Boise, Idaho.

climax BLUE STREAK ENGINES

utilize by-product Gas . . .

TODAY hundreds of Climax Engines installed in sewage plants are operated efficiently on sewage gas delivering continuous 24-hour service at a minimum maintenance expense. Selected to do the job because of their unmatched dependability, quality construction, slow speed and conservative rating. Built by Climax, a manufacturer with 38 years' engine experience.

Climax Blue Streak Sewage Gas Engines are four-cycle, multiple cylinder type for continuous duty, in sizes from 40 to 250 H. P. For emergency use in water works, gasoline engines are available in sizes 40 to 600 H. P.

Write for complete information and service record of Climax Engines to: Climax Engine & Pump Mfg. Co., 208 S. La Salle Street, Chicago, Illinois.

climax ENGINE AND PUMP MFG. CO.

Factory and General Office Clinton, Iowa

Regional Offices Chicago - Dallas -

professional organizations and large commercial institutions operating the principal underground metal plants in the United States. Included in the group is the American Public Works Assn., and the A.W.W.A.

The report consists of a foreword and the four bulletins as follows: I. Management Information on Cathodic Protection of Buried Metallic Structures Against Corrosion; II, Cathodic Protection Notification Procedures; III, Cathodic Protection Technical Practices; and IV, Joint Cathodic Protection Systems.

H. H. Anderson, representing the American Petroleum Institute and chairman of the Correlating Committee, emphasized that the procedures included in the report have been endorsed as good practice by all concerned. In consideration of the billion-dollar annual loss to American industry from underground corrosion, he urges every operator of an underground metallic plant to read the report.

Copies of the book may be obtained from the National Association of Corrosion Engineers, 919 Milam Bldg., Houston 2, Texas, at 50 cents per copy.

Odor Nuisance from Creek Eliminated with Nitrate of Soda

by A. R. TODD, *Supt., Water Purification, Wheeling, W. Va.*

The month of August was exceedingly dry in Wheeling, W. Va., and Wheeling Creek, which flows through the length of the city from east to west and carries all the sewage, dried up to the point where there were only pools of stagnant water. These pools became exceedingly foul smelling and resulted in hundreds of complaints to the Health Department and the City Manager. The Water Department was ordered to open hydrants near the upper end of the creek to see if a flow could not be started; but, since Wheeling Creek is 150 ft. wide, the results were negligible. The writer was then called in and instructed to see what he could do to improve conditions.

Fortunately State Water Commission inspectors had collected samples from Wheeling Creek five days before and had reported a high B.O.D. of 35 ppm., so it was a simple matter to calculate how much oxygen would be needed to change the decomposition from anaerobic to aerobic. Sodium nitrate was chosen as the medium and it was decided to broadcast this chemical at the rate of 72 ppm. or 600 lbs. per million gallons. The amount placed in each pool of the 4 mile long section of the creek that was treated varied from 10 lbs. to 50 lbs. Only 500 lbs. of nitrate were needed the first trip, but it was expected that we would have to repeat the operation in about four days. The experiment was completely successful, because the odor disappeared in less than 7 hours after treatment and did not start to be noticeable again until 7 days later. Then, just as we were ready to repeat the nitrate treatment it started raining and rained enough to start the creek flowing.

The total expenditure for chemicals was 500 lbs. of agricultural grade nitrate of soda at $4.25 per hundred or $21.25. The labor required was two men for 4½ hours, plus a truck and truck driver for the same period of time. The results were so conspicuous, the cost so moderate, and effort so simple, that I thought others might be interested.

THE SILENT WATCHMAN

DIXIE TANK AND BRIDGE CO.

3523 LAMAR AVE. P. O. BOX 14
MEMPHIS 1, TENNESSEE

Complete Service for Elevated Water Tanks—
Nation Wide Service—33 Years Experience

KEEP THE SAFETY FACTOR IN YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress. On completely reconditioned jobs, the painting is guaranteed for three years, repairs guaranteed for ten years, provided the tank is painted every three years by Dixie Tank and Bridge Company, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

Dixie's Nation Wide Service Satisfies

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THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST

Water Supplies For Wartime Fire Fighting

The Federal Civil Defense Administration, Washington, D.C., has published a Technical Manual on **Water Supplies for Wartime Fire Fighting.**

The manual was written to suggest methods of meeting the problems of water supplies for fire fighting in wartime. It states in the preface that, one of the lessons learned in World War II was that water supplies designed for normal peacetime use were not adequate for fighting wartime fires.

Public Water-Supply Systems; Water-supply works; Distribution system; Planning factors; Emergency operations; Auxiliary Water Supplies; Private water-supply systems; Supplies from natural sources; Auxiliary water storage; Experience in World War II; Fire raids on German cities; Fire raids on Japanese cities; are among the subjects discussed in the manual.

The Manual is available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. for 10 cents each. To obtain this manual please communicate directly with the above office.

Excerpts from Purdue's Sanitary Engineering News*

At Linton, Indiana, a test showed the leakage on 36,800 feet of 10-inch Cast Iron Pipe with 2,070 joints to be only one gallon in 11½ minutes at eighty-three pounds pressure.

At Niagara Falls 94,248,000 gallons of water per minute drop over the falls.

The water for the Hotel El Tavor, Grand Canyon, is lifted almost vertically 3,150-feet from Indian Gardens to the hotel. What a pressure on the line at Indian Gardens?

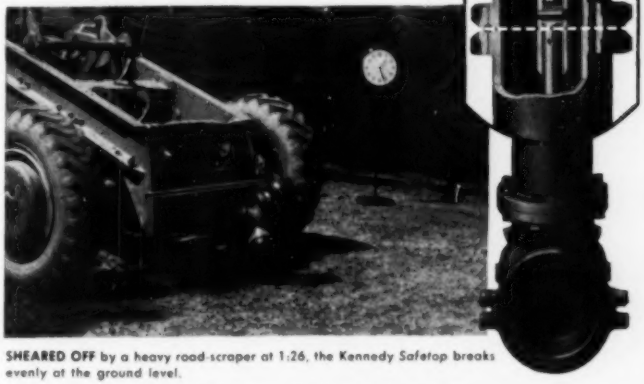
An article from Russia propagandizes the attainments of the Soviet Union in the sanitary engineering field. A description is given of the use of the well point method for dewatering areas, of ditchdiggers in sewer excavation, and of bulldozers for backfilling. The Russians sure do a lot of copying of our efforts, even though they dislike us so. Wonder who told them how to do the above mentioned developments.

An over-all national water policy is a necessity according to W. W. Horner, Past-President, ASCE.

*Edited by Prof. Don E. Bloodgood.

From Break to Service *in 11 minutes...*

THE KENNEDY SAFETOP is the only hydrant with the threaded breaking ring that gives positive connection and rigid alignment of the two standpipe sections. Extensive tests and actual service reports show that the Kennedy *Safetop* can stand as tough a blow as the conventional hydrant without damage. But under a smashing impact, it always breaks cleanly at the breaking ring, without damage to working parts.



SHEARED OFF by a heavy road-scraper at 1:26, the Kennedy *Safetop* breaks evenly at the ground level.

Photos taken at N. Y. State Section meeting, A.W.W.A., April 1949.

WITH ONLY an inexpensive *Safetop* Repair Kit and a few common tools, one man can permanently repair the Kennedy *Safetop*.

NO NEED FOR DIGGING because breakage is all above ground . . . no flooding because compression-type valve closes with water pressure.

IN JUST 11 MINUTES the Kennedy *Safetop* is back in service . . . working as smoothly and efficiently as if nothing had happened.

THE COMPLETE KENNEDY LINE includes a wide range of A.W.W.A. valves and fire hydrants. When you standardize your community on KENNEDY, you are assured of the same high quality and dependability that have characterized all products of KENNEDY for 74 years.

WRITE FOR SAFETOP BULLETIN 105

Est. 1877

THE **KENNEDY**

VALVE MFG. CO. • ELMIRA, N.Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

Dry ice has been used to create frozen cofferdams for bridge pier repair.

A quaternary ammonium compound is now available that will control (safely) algae in swimming pools with a dosage of 1:10,000.

Kentucky, Massachusetts, South Carolina, New Hampshire, New Jersey and Rhode Island all have new or newly revised stream pollution control laws.

The farthest-north Sequoia tree is on the estate of Mrs. G. A. Lyon at Bristol, R. I. It is about 60 years old, 64 feet tall, 8-feet in circumference.

Water can be transported in containers previously used for leaded gasoline if the water is filtered through granulated carbon and then chlorinated.

Refuse and garbage can be disposed of by the Sanitary Fill Method for 40c to 60c per ton.

According to a summary, there are 8,917 communities with sewer systems serving a total population of 74,740,887. About one-third of sewage from existing sewer systems is discharged untreated.

Horace Frye at Evanston, Illinois, has built a graphic display of his local water system to aid in the telling of the story of water treatment. The direction of flow is indicated by flashing lights.

Los Angeles reports that the use of Field Beds vs. underdrained sand beds reduces the operating cost per ton of dry solids from $4.25 to 88c. With the present system of operating the Field Beds it is possible to dry on them just about the same amount per acre per year (685 tons) as was formerly dried on the underdrained beds (663 tons).

Volcanic steam is used for power production in Italy.

Waste activated sludge is being used in place of water in the grinding of garbage at Marion, Indiana.

"I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of *science*, whatever the matter may be." Lord Kelvin, "Addresses," 1883.

The average analysis of Dutch Government Company compost from town wastes is as follows:

Nitrogen	0.4-0.5 %
Phosphate, soluble in mineral acid	0.4-0.5 %
Potassium, soluble in water	0.2 %
Calcium oxide, soluble in mineral acid	3.0 %
Magnesium oxide, soluble in mineral acid	0.3 %
Carbon dioxide	1.5 %
Moisture	25-30 %
Organic matter, except non-combusted coal particles	4.5-9 %
Copper	0.04 %
Boron	0.002-0.005 %

Quoted from Public Health Reports:

"Chlorination with residuals less than 0.9 ppm. appeared to be ineffective against tuberculosis organisms."

In 1949 there were 93.1 absences per hundred workers because of sickness and non-industrial injuries.

Human beings, like chickens, thrive best when they have to scratch for what they get.

WACHS NATIONAL PIPE SAW
Tough Cuts MADE EASY
Close quarters — only 14½" between 24" mains.
Two clean square cuts, and the pipe comes out.
MAKE FAST AND ACCURATE CUTS ON 10" TO 48" CAST IRON AND STEEL MAINS UNDER THE MOST DIFFICULT CONDITIONS
• Minimum Pipe Line down time.
• Cuts under water in flooded ditches.
• No broken pipe, milled cut.
• Thor Air-Powered, no flames near pipe.
• Set-up time about 15 minutes.
• Portable — weighs only 265 lbs. Two men can carry and set up unit.
• Small excavation — only 16" clearance needed.
• One machine cuts all pipe sizes from 10" to 48".
• Only two adjustments necessary for size changes.
Many tough pipe cuts must be made during construction, for emergency repairs and for maintenance. This one portable machine will handle all your pipe cuts from 10" diameter and up. You will not only save time and labor, but you will get tight joints because of the square milled cut. The Wachs Pipe Saw also cuts cement lined pipe and makes beveled cuts on steel pipe. This machine often pays for itself on a single job.
Write today for descriptive folder and engineering data on this new labor saving saw.
THE E. H. WACHS COMPANY
1525 NORTH DAYTON STREET CHICAGO 22, ILLINOIS

Water Repellent for Masonry

101

Dow Corning Corporation, Midland, Mich., has developed a Silicone Resin XR-129G for use in formulating a water repellent surface treatment for exterior and above-ground masonry.

Water repellents using the Silicone Resin XR-129G are said to repel water so effectively that rain scarcely wets the masonry and therefore, protects interior walls from moisture and prevents spalling caused by the freezing of wet masonry. Other advantages claimed are: makes new or old masonry resistant to efflorescence and staining; does not change the color or texture of masonry; does not fill the pores or prevent breathing; and will remain effective many times longer than conventional organic treatments.

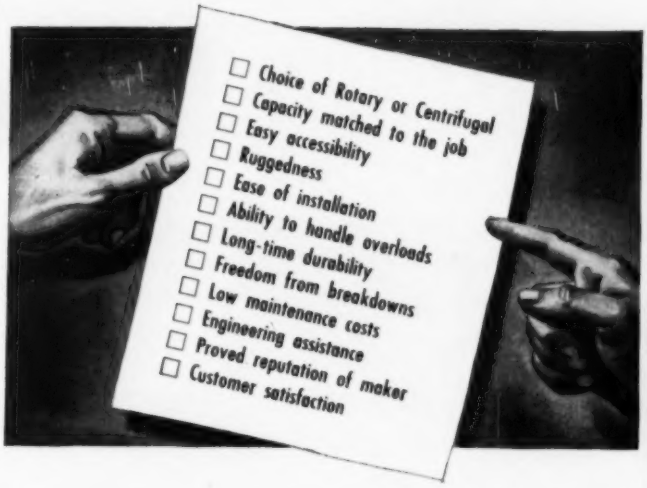
Carborundum Appoints Roy W. Brown

Carborundum Company, Perth Amboy, N.J., has announced the appointment of Roy W. Brown as Direct Sales Representative in an important new Sales territory in the southwest.

Mr. Brown, formerly Product Specialist for Carborundum's "MONOFRAX" fused cast refractory line, will handle all refractory products of the Carborundum Company in his new assignment.

A Ceramic Engineering graduate of Rutgers University, and later Research Associate and Instructor at Rutgers, Mr. Brown has been with

BEFORE BUYING *any* BLOWER COMPARE THESE ESSENTIALS



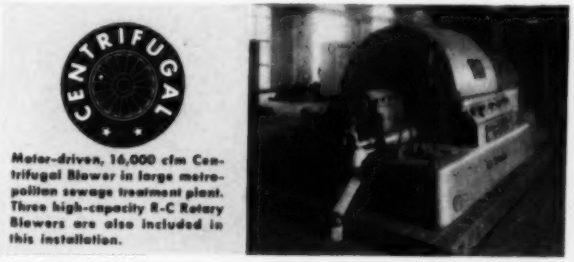
When operation of sewage treatment plants depends so vitally on adequate handling of gas or air, you can't afford to take chances on the performance of your blowers or exhausters. It's better to be safe than sorry.

So, for new installations or replacements, we suggest that you evaluate the equipment by the above standards of comparison. This will help determine the unit that will be most effective, economical and reliable for your specific applications.

Be sure to include the R-C *dual-ability* line of both Centrifugal and Rotary Positive types. Remember, that only we offer you this *dual choice* —with unbiased recommendations from almost a century of experience. With capacities from 10 cfm to 100,000 cfm or higher at moderate pressures, R-C equipment has a long record of outstanding performance in sewage treatment applications.

We'll gladly send detailed information for comparison—or supply engineering help if we can be of service.

ROOTS-CONNERSVILLE BLOWER CORPORATION
521 Mount Avenue, Connersville, Indiana



Motor-driven, 16,000 cfm Centrifugal Blower in large metropolitan sewage treatment plant. Three high-capacity R-C Rotary Blowers are also included in this installation.

Reg. U. S. Pat. Off.

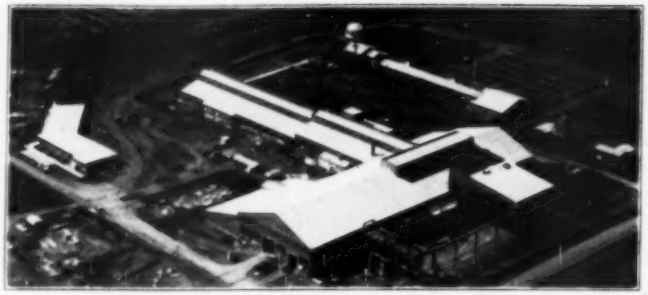
ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

the Carborundum Company since 1947.

U. S. Pipe Opens California Plant

United States Pipe and Foundry Co., Burlington, N.J., has announced that operations in the company's California plant, located at Decoto, Alameda County, began late last year. This marks the first time that cast iron pressure pipe has been cast centrifugally in metal molds on a production basis in any of the Pacific Coast States.



New West Coast Plant of U.S. Pipe & Fdry. Co.

The plant was designed by the Company's engineering department and constructed by the Austin Company on a 70-acre tract of land that was purchased in 1950. The main plant building and its appurtenances include all the facilities for the efficient manufacture of centrifugally cast iron pipe.

FOR WATER SOFTENING . . . TURBIDITY AND COLOR REMOVAL
. . . INDUSTRIAL WASTE TREATMENT . . .

The Clariflow

with independently-operated mixing, flocculation, stilling and sedimentation zones

The CLARIFLOW gives control over each individual function of controlled reaction stage flocculation, vertical clarification and positive slurry thickening and removal.

Initial mixing and reaction done in an isolated mixing tank insuring complete reactions.

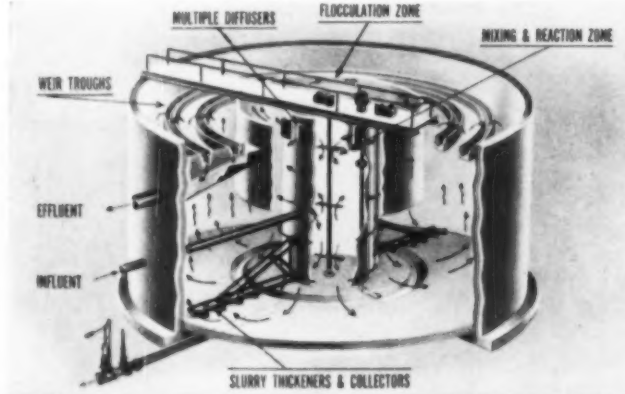
Exclusive multiple, tangential diffusers simultaneously and equally distribute flow to avoid "tendencies" and initiate slow flocculation.

Recirculation of precipitate for catalyzing purposes is positive and controllable. Erratic "Blanket Filtration" is not practiced.

Thickeners used to scrape settled slurry to the blow-off point.

Exclusive *Balanced* multiple surface weir troughs make efficient use of short detention periods and insure clarified overflows.

Write for Bulletin 656



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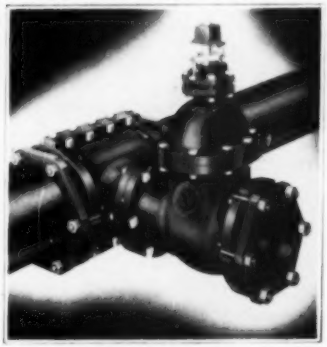
FACTORY • ENGINEERING OFFICES • LABORATORIES
AURORA, ILLINOIS
PROQUIP PROCESS EQUIPMENT



Tapping Sleeve with Stuffing Box Type Joint

102

A. P. Smith Mfg. Co., East Orange, New Jersey, has developed the Smith Mechanical Joint Tapping Sleeve that incorporates the time tested and proven stuffing box type joint.

The sleeve half-flange joints also embody the stuffing box principle to produce bottle tight joints without stressing the flanges or the bolts. Rubber side flange gaskets are molded on a metal backing and require no trimming to secure a proper fit. As the gaskets are confined, cold flow is minimized.

Simplicity of installation is one of the main features of the sleeve because poured and caulked joints are eliminated, adverse weather and wet trenches present no problem, and a narrower trench can be used. Skilled labor is not required as a 10 inch

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

ratchet wrench and a small open end wrench comprise all necessary tools.

New Plant For Infilco

Infilco, Tucson, Arizona, has announced the opening of the company's new research and executive headquarters building at Tucson, Arizona.

The $600,000 building, designed by Paul R. Williams, opened late last year according to an announcement by P. N. Engel, President.

Set on a seven and one-half acre plot, the new plant includes 40,000 square feet of floor space and will house the most modern facilities for Infilco's engineering, research and development divisions, as well as the home sales and executive offices.

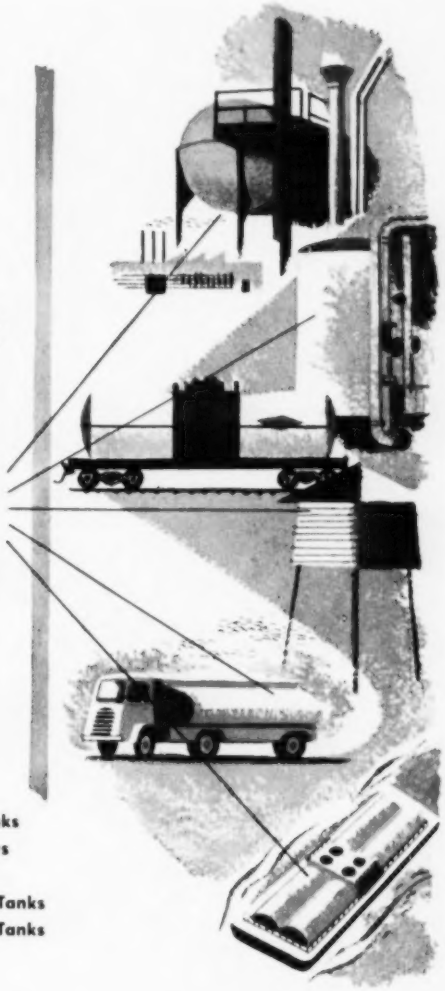
Collapsible Air Diffuser

103

Infilco Inc., Tucson, Arizona, has announced a new type of equipment for diffusing air or other gas into a liquid to produce agitation or to effect absorption.

cut corrosion costs with

SARAN RUBBER TANK LINING



in **Storage Tanks**
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Tank Cars
Processing Tanks
Production Tanks

Increase the life expectancy of costly equipment with saran rubber tank lining. The high degree of both chemical and abrasive resistance makes saran rubber an outstanding lining where resistance to grease, many solvents, acids and other chemicals is required.

Saran rubber can be applied easily and economically by experienced tank lining applicators located strategically throughout the country. Investigate this superior tank lining today. Contact your nearest Saran Lined Pipe Company office and find out how you can add years to the life of your costly equipment.

Write to the Distributor:

DEPARTMENT PL 205

Saran Lined Pipe Company

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Offices in: New York • Boston • Philadelphia • Pittsburgh
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Los Angeles • Portland • Cleveland • Denver • Seattle
Charleston, S.C. • Toronto

SARAN RUBBER
DOW
product

The Colaflex Diffuser, as the equipment is called, is a flexible, collapsible diffuser which maintains practically constant permeability for fine diffusion of air or gas in sewage and industrial waste treatment, water conditioning, biological manufacturing processes and absorption processes.

An important feature of the Colaflex Diffuser is the ease with which it can be cleaned and its permeability maintained. The diffusing element, is of fabric. Gas or air under pressure inflates the element to an erect, distended position and diffuses through the fabric to the liquid. All that is necessary to clean the fabric is to shut off the gas or air supply by means of the 3-way valve with which the system is provided. The gas or air is suddenly vented to atmosphere and the fabric is collapsed by the pressure of the liquid and inverted downward into its cup. This flexing of the walls dislodges or loosens solid particles that may have accumulated on or in the fabric, and the fabric is kept clean and its permeability maintained. So durable is the special fabric material used that, in test installations, the fabric has been collapsed many times daily and has shown no noticeable wear after many months.

"Ted" Kain

"Don" Vetromile

Personnel Changes at A. P. Smith

The A. P. Smith Mfg. Co., East Orange, N.J., has announced the retirement of Mr. J. L. Atwell and the appointment of Mr. Ted H. Kain and Mr. Daniel S. Vetromile to the sales staff.

John Atwell, has represented the company in the States of Pennsylvania and Ohio for many years, retired Dec. 31, 1951.

Ted H. Kain, formerly General Manager of the Columbia Pennsylvania Water Company, past president of the Pennsylvania Section of the A.W.W.A., has succeeded Mr. Atwell.

Daniel S. Vetromile, formerly with the Rockwell Manufacturing Co. and the De Vilbiss Co., will represent the company in New York and New Jersey.

Heat-Rem Paint Improved

104

Speco, Inc., Cleveland, Ohio, has announced the improvement of Heat-Rem H-170, the extra high heat resistant aluminum paint, to permit air drying in approximately 30 minutes.

According to the manufacturer, Heat-Rem H-170 is capable of withstanding temperatures up to 1700° F. Utilizing a silicone base, reputed to fuse with surface metal, it forms a bright, elastic finish resistant to moisture, corrosion, mild acids, alkalis and industrial fumes.

Sumner Joins Universal Concrete

Universal Concrete Pipe Company, Columbus, Ohio, has announced that Billy T. Sumner has joined the company as engineering representative to serve areas covered by Universal's Nashville, Tenn. plant and the Dixie Concrete Pipe Co., Louisville, Ky.

Sumner received his B. E. degree from Vanderbilt University in 1946, following three years military service. Since then he has been employed by Polk, Powell and Hendon, consulting engineers, being stationed at Nashville as resident engineer.

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

Hooker Plans New Chlorine Plant

Hooker Electrochemical Co., Niagara Falls, N.Y., plans to build a new $10,000,000 plant for the manufacture of chlorine and caustic soda at Montague, Mich., it was announced by R. L. Murray, Hooker president.

The new plant is expected to be in operation by the end of 1953, with a yearly production rate of approximately 100,000 tons of all products. Output of this plant is intended to serve midwest industry.

Design of the plant will be in charge of the company's own engineering department. Total plant area, including a brine field comprises over 400 acres. Situated near the shore of White Lake, its design will be planned to fit in with the natural beauty of the area.

Small Submersible Pump

105

Byron Jackson Co., Los Angeles, Calif., has developed a small submersible pump designed for small capacities at high heads from wells of 6 inches inside diameter or larger.

The BJ "Subette" pump has a capacity range of from 30 to 130 gpm at heads of from 80 to 770 feet. The motors, available in sizes of 5, 7½, 10, and 15 hp, are 3-phase 60-cycle, 2-pole, 220/440 volt and have a speed at 3500 rpm. A 50-cycle motor is available at a speed of 2900 rpm. All motors are oil-filled, mechanically-sealed, and capable of operating completely submerged in water.

C. H. Wheeler & Economy Pumps Consolidate

The Economy Pump Division of Hamilton-Thomas Corp., Hamilton, Ohio, is being consolidated with the C. H. Wheeler Manufacturing Co., Philadelphia, Pa.—another division of the corporation. Production, engineering and sales departments of Economy are being moved from Hamilton, Ohio, to the Philadelphia plant. Economy Pumps will henceforth be known as Wheeler-Economy Pumps.

Economy Pumps, Inc., started business in Chicago in 1914, supplying centrifugal pumps to the building trades. In the 20s the line was expanded to include non-clogging sewage pumps. In 1938 the company acquired the plant of the Liberty Machine Tool Co., which was continued as an affiliate of Economy Pumps. With its expanded manufacturing facilities, a great many types of larger pumps were added to the line.

The C. H. Wheeler company succeeded the Barr Pump Co. which started business in 1887. The development of the Wheeler line paralleled the development of the steam turbine generating unit.

Pittsburgh-Des Moines Moves Eastern Office

Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa., has announced the opening of an eastern sales office at 1060 Broadway in Newark, New Jersey. This new headquarters replaces the New York Office formerly located at 270 Broadway. Mr. H. W. Ford continues as eastern district sales manager.

SMITH BLAIR INC.

FLEXIBLE CAST-IRON COUPLINGS

• For cement-asbestos pipe
• For cast-iron pipe

Shown above: 6 in. Trans. (150 Barrel) x 4 in. Trans. (150 Barrel) x 4 in. Trans. (150 M. E.) x 6 in. C. I.

Featuring the "family characteristics" of all Smith-Blair products — durability, serviceability, and ease of installation — these flexible cast-iron couplings are designed to cut costs on many different installations:

CAST-IRON COUPLINGS THAT WILL CONNECT:

- Cast-Iron Pipe of Various Classes
- Cast-Iron Pipe to Cement-Asbestos Pipe
- Cast-Iron Pipe to Standard Steel Pipe
- Cement-Asbestos Pipe to Standard Steel Pipe

Size Range: From 2.5" o.d. to 29.34" o.d., inclusive

SMITH-BLAIR, INC.

MAIN OFFICE AND FACTORY, P.O. Box 666, South San Francisco, Calif.

BRANCH:
8241 Phlox Street
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MANUFACTURERS OF: REPAIR CLAMPS, FULL CIRCLE CLAMP COUPLINGS, WATERLOCK RINGS, FLEXIBLE COUPLINGS, SERVICE CLAMPS, OTHER SPECIALTIES

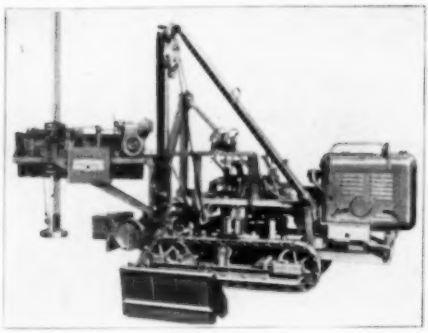
If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

Versatile Tamper, Backfiller, Side-Crane

106

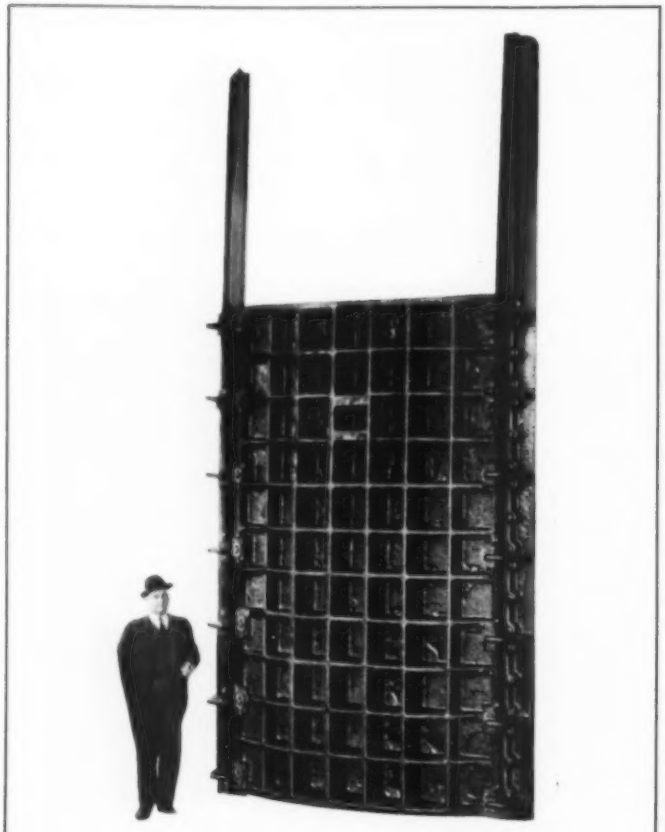
Cleveland Trencher Co., Cleveland, Ohio, has developed a one-man-operated machine that tamps, backfills, lays pipe, unloads and handles pipe, sheathing, etc. and does all types of light crane work. According to the company, it is designed to perform these operations better, faster, and cheaper than methods generally used heretofore.

The machine is mounted on a crawler having 24 separate travel speeds, ranging from one foot per minute up to 2⅛ miles per hour.



The Model 80 tamps while traveling either along the side of the trench or straddling it. The tamper delivers a 380 ft.-lb. blow, 45 times each minute, compacting the earth in layers that are 3 to 4 times thicker than is practical by air or hand tamping, and pavement may be relaid immediately without danger of settling.

The Model 80's backfiller is a conventional drag-line type with a telescopic boom. Elimination of all excess weight permits use of the model 80 with complete safety over sidewalks and lawns.



FILER & STOWELL SLUICE GATES

are built to stand long trouble free service. Amply proportioned for all stresses of shipment, erection and operation. They may be obtained with manual, hydraulic cylinder or motor operating controls.

THE FILER & STOWELL COMPANY
MILWAUKEE 7, WISC.

Regenerate Waste-Clogged Septic Tanks

107

Chemical Research Products, Seattle, Wash., has announced a new product for activating waste-clogged septic tanks.

According to the manufacturers, SEA-CAL, is a scientifically balanced compound of chemically and biologically active elements which quickly restores waste-clogged septic tanks of any size to normally efficient operation.

SEA-CAL works by enzyme action, stimulates the development of the essential digestive bacteria which attack and liquidize the proteins, fats and starches which clog septic tanks. It strongly counteracts the adverse effects of excessive soaps, alkalis and cleansers, it is reported. The product is guaranteed non-poisonous, non-injurious to plumbing, and is simple and easy to use.

G-E Changes Disposal Marketing

The General Electric Co., Bridgeport, Conn., will henceforth market a single garbage disposer model and will make it available either with or without a flow switch, it has been

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

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Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

announced by C. J. Enderle, general manager of the electric sink and cabinet department.

Until now, the company has sold two disposer models—one with slightly larger waste storage capacity than the other. Both were equipped with flow switches.

Because of continuous improvements in design and performance and the experience gained from many thousands of installations, however, the company has now decided to sell its disposer either with or without the flow switch. "This will make the use of the flow switch entirely dependent upon local conditions and requirements," Mr. Enderle said.

Canal Liner For Seepage & Erosion Control

108

Owens-Corning Fiberglas Corporation, Toledo, Ohio, has designed a new Irrigation Canal Liner for the control of seepage and erosion in ditches and canals.

The Liner, developed by Owens-Corning in cooperation with the Bureau of Reclamation of the U. S. Department of Interior, is a Fiberglas-reinforced prefabricated asphaltic membrane lining for installation on bottoms and sides of most types of canals, lateral ditches, ponds or pools.

Fiberglas Canal Liner can be applied at any time during the year and can be stored indefinitely. It can be installed with handtools and unskilled labor. Two men can install it, and a crew of four to six men can apply from 200 to 300 square yards an hour under normal conditions.

Supplied in rolls, the liner is three feet wide and 36 feet long, and may be installed longitudinally or transversely. Rapid-setting cut back asphalt is used to seal joints of the strips which are overlapped by at least three inches. The liner has a long life and is impervious to moisture and soil acids; strong enough to resist tearing and puncturing; and flexible enough to conform to the contour of the ground surface.

Worthington Promotes Seven Plant Executives

Worthington Pump and Machinery Corporation, Harrison, N.J., has named seven plant executives to new posts according to an announcement by Mr. E. J. Schwanhausser, Executive Vice President.

Manufacturing Executives in new posts include:

Mr. George P. Passmore, Assistant to the Vice President in charge of Manufacturing at Harrison, N.J. Mr. Passmore has been serving as Works Manager of Worthington's Wellsville, N.Y. plant since 1941.

Mr. A. M. Tullo, Works Manager of the company's Wellsville, N.Y. plant. Since 1945, Mr. Tullo has been Assistant Works Manager at the Harrison Plant.

Mr. John Burlick, Assistant to the Works Manager at the Harrison in charge of industrial engineering activities. Since 1945, Mr. Burlick has been manager of the Methods and Standard Dept.

Mr. Max A. Heyman, Assistant to the Works Manager at the Harrison plant in charge of production control activities. He has been manager of the Production Department at Harrison since 1945.

Want to know for sure what chlorine feed you're getting? Then don't take chances with chlorinators that only "suggest" the flow. Install *modern* BUILDERS Visible Flow CHLORINIZERS . . . the chlorine gas feeders with built-in Sightflo indicators. Here's positive flow information you can really trust —these indicators are accurate within ± 4%!

Other important advantages of Builders Chlorinizers are:

Low maintenance because Chlorinizers meter and control chlorine gas in the dry, non-corrosive state.

Easy operation because Chlorinizers are built of simple components, easy to understand and easy to service or replace.

Dependable performance because Chlorinizers have only one vital control part: the tantalum-diaphragm chlorine valve with its Hastelloy valve needle, silver valve seat, and enameled valve lining.

Chlorinizers are available in three volumetric models — for any chlorination service:

Up to 400 lbs./day . . . Model DVSX . . . Bulletin 840-F2A
Up to 2000 lbs./day . . . Model CVS . . . Bulletin 840-F1
Up to 6000 lbs./day . . . Model HCVS . . . Bulletin 840-G27

For Bulletins, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 350 Harris Ave., Providence 1, R. I.

FOR ANY CAPACITY • FOR ANY CHLORINATION SERVICE

BUILDERS PROVIDENCE *Instruments*

BIF INDUSTRIES — BUILDERS

Engineering Executives in new posts include:

Mr. W. E. Sizer, manager of Regional Engineering and Service Dept., with headquarters at Harrison. Since 1940, Mr. Sizer has been Executive Engineer for the Harrison plant.

Mr. George F. Habach, Executive Engineer at the Harrison plant. Since 1945, Mr. Habach has been Chief Engineer of the Centrifugal Engineering Division.

Mr. Everett Schmachtenberg, Chief Engineer of the Centrifugal Engineering Division at the Harrison plant. Mr. Schmachtenberg has been Assistant Chief Engineer of this division.

Concrete Wall Leak Sealer

109

Flextrock Company, Philadelphia, Penna., has announced a new stabilizing ingredient that has been added to "Flextite" that speeds up action in sealing off leaks and water seepage in concrete walls.

The new Flextite provides quicker action and more thorough bonding and thus increases protection. A liquid chemical that is mixed with cement or cement and sand, it provides a mortar that is easily handled, fast setting. Forced into an opening, even against hydrostatic pressure, it is said to seal off severe, fast-flowing leaks in a matter of minutes.

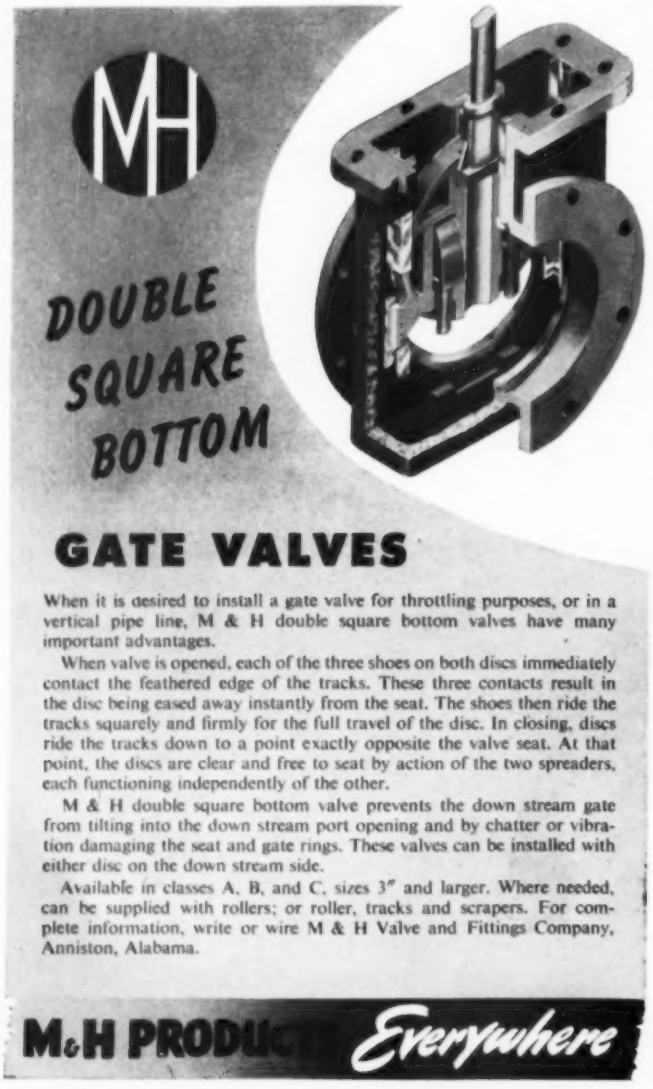
Material is also recommended for plaster-coating walls above or below ground or water level, pointing up spalled areas, and for converting wet, damp areas into dry, useful space.

John P. Harris Retires

Industrial Chemical Sales Division of West Virginia Pulp and Paper Co., New York, N.Y., has announced that John P. Harris, a pioneer in the development of active carbon as a water purifying agent, is retiring as Chicago district manager.

Mr. Harris, who has been selling the company's chemical products in 16 midwestern states for a quarter of a century, has reached retirement age. He will be succeeded by John Zieserl, formerly administrative assistant to the vice-president in charge of chemical sales in New York.

After his retirement Mr. Harris will operate his own chemical sales business at 1791 Howard St., Chicago, Ill.


DOUBLE
SQUARE
BOTTOM
GATE VALVES
When it is desired to install a gate valve for throttling purposes, or in a vertical pipe line, M & H double square bottom valves have many important advantages.
When valve is opened, each of the three shoes on both discs immediately contact the feathered edge of the tracks. These three contacts result in the disc being eased away instantly from the seat. The shoes then ride the tracks squarely and firmly for the full travel of the disc. In closing, discs ride the tracks down to a point exactly opposite the valve seat. At that point, the discs are clear and free to seat by action of the two spreaders, each functioning independently of the other.
M & H double square bottom valve prevents the down stream gate from tilting into the down stream port opening and by chatter or vibration damaging the seat and gate rings. These valves can be installed with either disc on the down stream side.
Available in classes A, B, and C, sizes 3" and larger. Where needed, can be supplied with rollers; or roller, tracks and scrapers. For complete information, write or wire M & H Valve and Fittings Company, Anniston, Alabama.
M&H PRODUCTS Everywhere

Master Septic Tank

110

San-Equip Inc., Syracuse, N.Y., has announced the manufacture of the new No. 1050 San-Equip Master Septic Tank, incorporating all latest design features developed by modern sanitary engineering and meeting every requirement of the new Commercial Standard CS 177-51 for Metal Septic Tanks.

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

Horizontal in design and made of heavy, 14-gauge steel with electrically welded seams, the new tank is designed with a length twice the width and a four-foot liquid depth. Of full five hundred gallon liquid capacity, it has an access opening at the top to facilitate inspection and permit pumping out without costly digging. Intake and outlet openings are located at the ends, correctly baffled to reduce the possibility of clogging.

Another important new feature is a special bituminous emulsion coating on the inside surface—in addition to the heavy hot-dipped mineral asphalt coating applied both inside and out.

Link-Belt Appoints Pearce

Link-Belt Company, Chicago, Ill., has announced the appointment of Bert L. Pearce as Chief Engineer of the Ewart Plant in Indianapolis, to succeed Charles R. Weiss, who has retired after 42 years' service at the company's Philadelphia and Indianapolis plants. Mr. Russell T. Sweeney has been appointed Asst. Chief Engineer.

Mr. Pearce, a mechanical engineering graduate from Rose Polytechnic Institute, 1935, entered the employ of the order department of the Link-Belt Dodge plant, Indianapolis, in 1936. He has meanwhile held various important positions in engineering and sales at both Dodge and Ewart plants, and for the last 10 months has been asst. chief engineer for product design.

Control For Water Bath Temperature

Fisher Scientific Co., Pittsburgh, Pa., has announced the development of the new Fisher Isotemp Bath which provides precise control of water bath temperatures in an order never before attained.

The constancy of bath temperature claimed for the new bath is plus or minus 0.005 degrees centigrade over its entire range of about minus 5 to plus 107 degrees centigrade. Actual tests have produced variations as small as two-thousandths of a degree over a long period of time.

A complete design change from conventional water bath, the Isotemp bath employs an electronic circuit to control a 400-watt and an 800-watt heaters. Also, the heating elements, stirrer and controls are contained in a central column with all connections made through the bottom of the 15 x 15" Pyrex brand glass bath—thus providing an unobstructed top surface for inserting samples.

Stirring is effected by a 1150 rpm. motor and propellers so that the entire 10 gallon water (or light mineral oil) content is constantly in motion.

The new bath is housed in a cube-shaped case with an opening in front for observation of samples under test. The back portion and bottom of the bath have been ground, and are illuminated from below with fluorescent lamps for maximum visibility. Samples, inserted through any of eight openings in the rotatable cover, may

48" GATE VALVE INSERTED UNDER PRESSURE
to Avoid Stoppage of Steel Production

Section removed from main

Finished insertion

CUTTING THE MAIN. Illustration shows cutting dome, temporary shut-off valve and permanent valve body in place.

At a large Eastern steel mill uninterrupted production depended upon a thirty year old, 48" cast iron main, carrying sea water used for cooling the furnace jackets. The main was in poor condition — badly corroded and electrolytically pitted.

In order to provide an emergency by-pass in the event of line failure, a gate valve was required. Since the mill could not risk even a momentary shut down, Smith was asked to insert the valve under pressure. Although of unprecedented size, the insertion was completed in four days without interruption of service or reduction in pressure.

*First 48" insertion ever made under pressure. One month later a second 48" gate valve was inserted by Smith for the Water Bureau, Philadelphia, Pa.

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Combination DRIVES

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INVESTIGATE NOW . . . get the facts on the Johnson Right Angle Gear Drive. Send for illustrated catalog.

PHOTO: Installation at Red Bank, New Jersey. Courtesy Layne-New York Company.

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be turned to the front of the bath for observation. An accessory cooling coil may be obtained which permits bath temperatures below that of the room.

Davey Compressor Appoints Howard

Davey Compressor Co., Kent, Ohio, has announced the appointment of R. E. Howard as comptroller and assistant treasurer.

Mr. Howard for the past six years has been the manager of the company's internal orders and invoicing departments. Prior to joining Davey and during World War II, he was a maintenance and processes engineer with the U. S. Army Air Corps. His experience also includes affiliation with the stoker division of Fairbanks-Morse Co.

Mr. Howard is a bachelor of science graduate of Western Michigan College and also studied engineering at the University of Michigan.

Field Flare Burner

112

John Zink Company, Tulsa, Okla., has announced a new field flare burner designed for the smokeless burning of large volumes of disposal gases along with low steam consumption and high resistance to heat damage. The new flare is for use in sewerage disposal plants, refineries, gasoline plants and other facilities where excessive volumes of gasses must be burned as a means of disposal.

Made of heat resisting alloys and employing a new method for cooling of the burner parts in combination with completely stable piloting in winds up to 80 mph are some of the features claimed for this new flare burner.

Conoflow Opens New Auxiliary Plant

Conoflow Corporation, Philadelphia, Pa., has announced the opening of an auxiliary plant to enlarge its manufacturing facilities in the Philadelphia area.

President R. B. Werey, stated that Conoflow has recently expanded its activities to service many high-priority defense orders, in addition to filling the vital needs of private industry. Having outgrown its present location due to this increased production, Conoflow has arranged to lease a two-story building, in close proximity to the main office and factory. Plant No. 2, which fronts on 21st Street extending through to Van Pelt Street, is being completely refurbished

SAVE HOURS,
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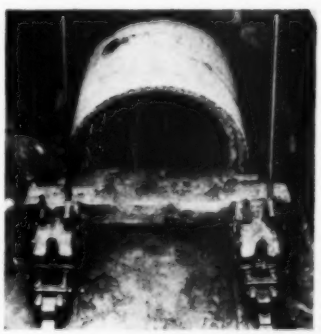
PUSH PIPE UNDER STREETS, TRACKS, walks, floors and other obstacles with a GREENLEE Hydraulic Pipe Pusher. One-man-operated, portable, simple to operate. No tearing up of pavement . . . eliminates extensive ditching, tunneling, back-filling, tamping, repaving. Cuts job time to a fraction. GREENLEE Hydraulic Pipe Pusher often pays for itself on first job. Two sizes—model shown above for pushing ¾ to 4" pipe. Larger unit, below, for pipe over 4", concrete sewer pipe and large drainage ducts. Power pump also available for extra ease and speed of operation.



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If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

to accommodate the assembly and shipping division.

Pennsalt Adds Chlorine Unit

Pennsylvania Salt Mfg. Co., Philadelphia, Pa., has announced the beginning of the second major step in the development of its Calvert City, Ky., works. This consists of adding new facilities, including an electrolytic chlorine-caustic soda unit, at an estimated cost of $8,000,000.

As the first step, Pennsalt completed a hydrofluoric acid and sulfuric acid plant in 1949 on its Tennessee River location. These facilities have been expanded by the addition, in 1950, of a unit to produce end products from captive hydrofluoric acid and, now nearing completion, a 33% increase in hydrofluoric acid capacity.

Addition of the new unit will combine at one works four basic chemicals—hydrofluoric acid, sulfuric acid, chlorine and caustic soda, the first combination of these four products in one works in the U. S.

Stainless Steel Tops For Lab. Furniture

113

Fisher Scientific Co., Pittsburgh, Pa., is now offering stainless steel tops for laboratory furniture. The tops are manufactured in Fisher shops to fit basic models of Unitized Laboratory Furniture, sold exclusively by Fisher's five plants.

Each top, supported by thick plywood sections, is made in one piece with an integral splashback and reagent shelf. Stainless steel used in the new tops contains over 30% nonferrous alloying materials, making it highly resistant to the action of common laboratory reagents.

All edges of the tops are a continuation of the upper surface and adjacent edges are clearly welded. The front edge is not sharp-angled but rolled for the protection of the laboratory worker. Concealed bolts and Neoprene strips close the joints between adjacent units in an assembly and produce a liquid-tight fit.

Hooker Appoints Miller

Hooker Electrochemical Co., Niagara Falls, N.Y., has announced the appointment of Mr. Harris C. Miller to the sales territory comprising upper New York state and western Pennsylvania.

A graduate chemical engineer from Worcester Tech., he has been with the company since 1941. Since 1949 he has been in sales work both in the New York City area and in the sales offices at Niagara Falls. Prior to his sales activities he has served in various chemical engineering capacities including process study engineer, and in special plant engineering and production assignments. Mr. Miller's headquarters will be at Niagara Falls, N.Y.

"Mix-With-Paint" Insecticide

114

Dianol Sales Corporation, Allentown, Pa., has announced the development of Dianol "mix-with-paint" insecticide that employs an entirely

(Continued on page 103A)

1.
WHAT ?? WENT WESTWARD ?
2.
WHAT ?? ARE ALARM CLOCKS ON FARMS ?
3.
WHAT ?? SAILED THE SEVEN SEAS ?
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If yours is one of the pioneer cities planning a fluoridation program, it will pay you to come to %Proportioneers% for your equipment. Already we have had almost six years' experience in this revolutionary phase of water treating. Whether you want a simple chemical feeder, or a complete installation with accessories for automatic proportional fluoridation, you're sure and you're safe if it's %Proportioneers%. Mail coupon or write for data and recommendations.
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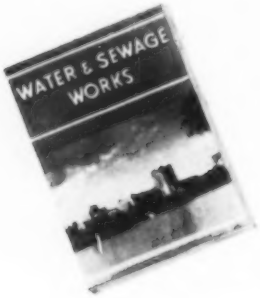

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(Continued from page 101A)

new scientific approach to the universal problem of insect control. According to the company, it virtually paints insects away in one application, for the life of the paint—normally 4 years.

Dianol is easily and uniformly mixed with all types of interior and exterior paints including oil, water, and dry paints, as well as whitewash, casein, cement and stucco paints. The company states that it brings certain death to all flying, crawling, chewing, and sucking insects, yet is completely odorless and non-toxic to humans and household pets.

It is claimed that Dianol does not change the normal characteristics of the paint and does not affect the color. Like the pigment, Dianol does not dissolve, but is suspended in the paint. This permanent residual quality remains active throughout the entire thickness of the paint film as well as on the surface and means certain death for all insects after contact. Death occurs within 15 minutes to a few hours, depending on the insect. Dianol by actual test has retained its effectiveness for as long as 5 years.

Universal Concrete Pipe Appoints Smith

Universal Concrete Pipe Co., Columbus, Ohio, has announced the appointment of Leroy Smith as sales representative at its Norristown, Pa., plant.

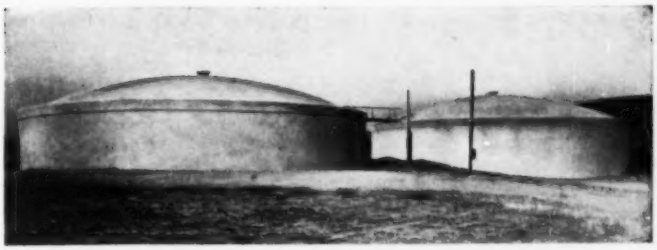
Smith, who has had a wide experience in the field of concrete, will handle Universal's full line of precast concrete products.

Douglass Taber Alden W. Carpenter

Builders Adds Personnel

B-I-F Industries (Builders-Providence, Inc. Proportioneers, Inc., and Omega Machine Co.), has announced the appointment of new personnel in Pittsburgh, Minneapolis, and Providence.

Douglass Taber, a graduate of Brown Univ., has joined the company as Manager of the Pittsburgh office. Since 1936, Mr. Taber has been asso-



PRE-STRESSED "GUNITE" TANKS

Above are shown two 80' diameter 750,000 gallon pre-stressed "GUNITE" water storage tanks with "GUNITE" dome roofs. We built these tanks in 1943 for the Borough of Schuylkill Haven, Penn.

Pre-stressed "GUNITE" produces a water storage tank which is bottle tight and maintenance free. They may be built either at ground level, completely underground with earth covering over the dome roof, or may be in the form of stand-pipes or elevated tanks.

Our experience in this field includes scores of tanks and silos of many types ranging up to two and one-half million gallons capacity.

The use of "GUNITE" for repair and construction of reservoirs, bridges, buildings, etc., is illustrated and described in Bulletin C2400. We will gladly send a copy at your request. On your letterhead, please.

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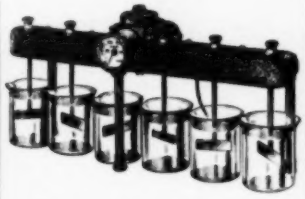
GENERAL OFFICES—ALLENTOWN, PENNA. U.S.A.
MANUFACTURERS OF THE CEMENT GUN

P & B Multiple Stirrer



When several samples are mixed simultaneously under identical conditions the optimum concentration of flocculent may be quickly selected and translated to plant quantities . . . The mixes takes 1,000 ml. beakers. Speeds from 10 to 100 r.p.m. are standard.

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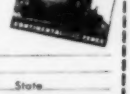

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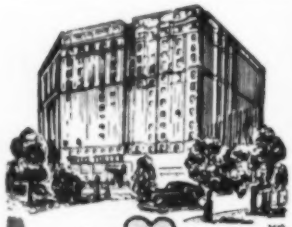

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ciated with Greeley and Hansen Consulting Engineers of Chicago.

Alden Carpenter, a graduate of the University of Minnesota and formerly with Hitchcock and Estabrook, Consulting Engineers of Minneapolis, will be in charge of the Minneapolis office located at 221 Sexton Bldg.

Raymond McIndoe

Raymond McIndoe, a graduate of Rice Institute, and formerly with the Penna. Dept. of Health, has been appointed Assistant Manager of the Standard and Engineered Products Div. of Builders-Providence, Inc.

Carboy Pump

115

Laboratory Industries, Inc., Chicago, Ill., has announced the development of a CARBOYPUMP for dispensing corrosive liquids from carboys and other large containers.

Designed by Dow Chemical Co., with revisions by J. A. Glover, Chief, Glass Blowing Section, Sinclair Research Laboratories, the CARBOYPUMP offers a safe, practical solution for dispensing a large variety of solvents, acids, alkalies and liquid organic materials from glass, rubber and metal containers. The density of the liquid has no effect because the pump operates on the positive displacement principle. Heavier viscosity fluids are handled just as readily, although at a slower pumping rate.

The pump is fabricated from heavy Pyrex tubing. Check valves are Pyrex and pumping ring is Teflon. Standard ball joint connects pouring spout to pump body and is held in place with standard ball joint clamp. Teflon pumping ring is readily replaced in case of wear.

Roberts Filter Holds Quarter Century Club Meeting

Roberts Filter Manufacturing Company, Darby, Pa., has announced that the fourth annual banquet of the Quarter Century Club was held late last year for employees who have served the company for 25 or more years. One new member was admitted to the Club, making a total of 20 service and 3 honorary members.

Percy Foster, Jr., was elected President and Carlisle H. Reville Secretary of the Club for 1951.

Literature & Catalogs

Rotameter Bulletin

116

Brooks Rotameter Company, Lansdale, Pa., has just released a bulletin showing the complete line of **Brooks Rotameters.**

The bulletin states that Brooks Rotameters are designed to meet every known purge meter requirement. The complete line covers the range from the inexpensive Brooks-Mite for small flow indication of liquids or gases, to the high capacity, high presure meters. Research and test kit models for a wide range of applications are also discussed.

Flow Signal Transmitter

117

Hagan Corporation, Pittsburgh, Pa., has just published a bulletin on the **Hagan Flow Signal Transmitter.** The Transmitter is a pneumatically operated pressure-differential measuring unit that transmits proportional signals to remote recording or indicating instruments, or to automatic control elements.

Diagrams of the bulletin illustrate seven suggested uses of the Transmitter in measurement of flow, liquid fuel, liquid level, and absolute pressure.

A cutaway drawing in color illustrates the principles of operation of

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the Flow Signal Transmitter. Other plates show the various types of differential measuring elements and illustrate the use of a dead weight checking attachment for reference calibration of the Transmitter under full static pressure.

Diaflote Storage Tanks

118

Hammond Iron Works, New York, N.Y., has just published a bulletin describing the **Diaflote Tank,** developed for liquid storage.

The bulletin covers in detail the unique construction feature of the Diaflote which consists of a Vulcalock membrane, attached to the inside periphery of the tank, which rests on the surface of the stored liquid to act as a barrier between the liquid and the air in the tank and prevents the formation of vapors. According to the bulletin, the Vulcalock membrane, eliminates breathing and filling losses; prevents contamination or dilution of high purity products; excludes air from the deaerated products; decreases corrosion inside the tank shell and reduces fire hazards to a minimum.

Also illustrated and described are Diaflote tank installations resulting from the conversion of existing tankage with a minimum of new materials.

Rotomotor for Positioning Control

119

Conoflow Corporation, Philadelphia, Pa., has just made available an eight-page illustrated bulletin fully describing the **Cono Rotomotor,** a completely pneumatic gear-driven operator for throttling control service.

The bulletin states that the Rotomotor is applicable to heavy-duty services such as catalyst slide valves, large gate valves, heavy dampers, blast gate valves and Saunders patent valves.

Complete engineering data describing outstanding features, dimensions, methods of operation, and various applications of the Rotomotor are also given.

Cast Iron Pipe

120

Lone Star Steel Company, Dallas, Texas, has published a booklet on **Cast Iron Pipe.** The booklet describes the facilities, the materials and the cast iron pipe products of the company, and states that Lone Star is the only producer of cast iron pressure pipe between the Mississippi River and the Rocky Mountains.

Photographs show the physical lay-out of the plant along with the various operations concerned with the manufacture of the pipe. Pipe dimensions, terms, conditions of sale, and complete Federal specifications for water pipe covering, Cast Iron bell and Spigot, and Bolted Joint types complete the booklet.

Excavator Catalog

121

Koehring Company, Milwaukee, Wis., recently prepared and has made available a new sales catalog describing the latest advancements made on the **Koehring Model 304 Excavator** and its attachments. The attractive two-color booklet contains 117 illustrations and drawings that depict the story of design, construction, work capacity and wide application of the heavy-duty excavator.

Numerous action photographs are employed in the new catalog along with machine part pictures to support the theme of low operating cost and extra work capacity of Koehring excavators. Included are detailed descriptions of Koehring features such as self-cleaning crawler shoes, skeleton type tapered drum lagging, automatic boom hoist brake, mechanical booster clutch, continuous chain crowd, full rotating fair-lead and the safe power boom lowering device.

In addition, detailed line diagrams illustrate the direct flow of power in the Model 304 through the simple three shaft upper machinery arrangement to the vertical shafting of the excavator.

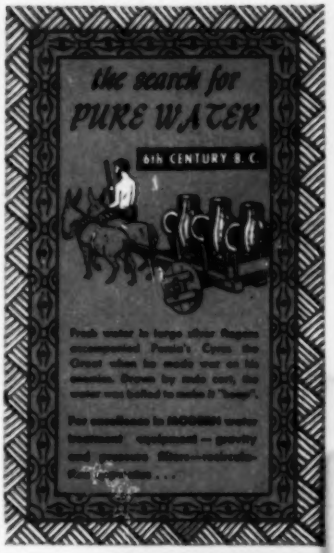
Chronoflo Telemeter

122

Builders-Providence, Inc., Providence, R.I., has issued a new bulletin on **Chronoflo Telemeters.** This 8-page bulletin describes the Chronoflo Telemeter, which makes possible the transmission of information and controls over a simple two-wire electrical circuit for unlimited distances.

The bulletin lists the many features of the device, describes the operation of the transmitter and receiver, and shows photographs and diagrams to illustrate the mechanism and installations.

Among the applications for the Chronoflo Telemeter, the bulletin describes measurements of flow of liquids and gases through Venturi tubes, nozzles or orifices; flow over weirs, through Parshall flumes and Kennison Nozzles; proportional control of chemical feed, pump control, and liquid level measurement; also pressure and temperature Telemetering.



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"Since 1885"
Sewage and Garbage Shredders
Detailed Specifications and suggested Installation Drawings furnished
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ST. LOUIS 6, MO.

Pipe Cleaning Service

123

Ace Pipe Cleaning Contractors, Inc., Kansas City, Missouri, has published a 6-page, 2-color bulletin describing its **Mobilized Pipe Cleaning.**

The bulletin states that Ace service is fast, efficient, is available anywhere, any time, under any and all conditions, and makes possible up to 75% savings in sewer and pipe cleaning costs.

Ace maintains complete fleets of truck units that carry complete equipment for the job. A description, complete with photographs, covers the methods used by Ace for this work.

Wet-Pit Freeflo Pumps

124

Worthington Pump and Machinery Corp., Harrison, N.J., has just published a new bulletin describing **Freeflo Pumps** for sump, sewage and drainage service.

The bulletin describes the FL.J and FL.JD wet-pit pumps as having non-clogging sewage impellers capable of passing solids and stringy material. Unlike most designs of wet-pit non-clogging pumps, these pumps have a stuffing box above the impeller and the pump bearings are above and separate from the box. As the stuffing box is normally inaccessible, it is equipped with U-cup packing which requires no adjustment and which has proved its success in vertical turbine pumps handling sandy water.

A cross-section drawing, graph of coverage for 60-cycle motor speeds, dimensions in inches and data on flanges complete the bulletin.

Vertical Propeller Pumps

125

Worthington Pump and Machinery Corporation, Harrison, N. J., has published a bulletin on **Vertical Propeller Pumps** for flood control, drainage, irrigation and similar low head services.

The bulletin contains cross section drawings, dimensions and a discussion of recommended clearances for the pumps.

Anti-Rust Paint

126

Monroe Company, Inc., Cleveland, Ohio, has published a bulletin describing **RUST-CURE Anti-Rust Paint.**

The bulletin states that RUST-CURE can be applied on rusted surfaces without wire-brushing, scraping or sandblasting. Consequently it cuts maintenance costs by greatly reducing the tremendous amount of time and labor required to paint corroded metal by ordinary methods.

General Purpose Pumps

127

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has just released a new bulletin giving the construction details on grease-lubricated pedestal-mounted **General Purpose Pumps.**

The bulletin states that the pumps, available in capacities to 2500 gallons per minute at heads to 550 feet, can be had with stuffing box or mechanical seal, direct coupling or V-belt drive, and in a choice of materials.

A large 2-page cut-away diagram of the pump shows all working parts and descriptive text gives complete construction details. Types of pedestal arrangements, and a complete dimension chart complete the bulletin.

Study of Water Hammer

128

Williams Gauge Co., Pittsburgh, Pa., has just published a new 8-page bulletin covering the cause, effect and control of **Water Hammer in Piping Systems.** After describing water hammer in non-technical terms, the brochure indicates its potential damage to piping, instruments and other parts of water systems, and then considers methods of controlling it.

A phase of hydraulics about which little is known, water hammer was studied in detail in several hundred tests. Among other things, the intensity, the action of the pressure

TANKS ON TOWERS

50,000 on 100' tower
100,000 on 85' tower
100,000 on 125' tower
100,000 on 100' tower

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REMOVED AND INSTALLED

Also: Stand-by Diesel, gas engines, and Generator sets; good condition.

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wave and the origin of water hammer were studied. Shown in this new brochure are a number of curves representative of some of these tests. The curves indicate pressures up to 304 lbs. developed in 1/10 of a second, and illustrate the bellows-like expansion and contraction of a pipe subjected to water hammer.

Also included in the booklet are the results of further tests made to determine what effects check valves have in overcoming water hammer. Tests on both conventional swing check valves and the newer type silent check valve are reported.

Plunger Pump

129

Dorr Company, Stamford, Conn., has just published a new bulletin on the **Dorrco Plunger Pump.**

The bulletin describes the Plunger Pump as a dependable unit for pumping sludges in water, sewage and industrial waste treatment plants. Distinguishing characteristics are said to include an adjustable stroke for quick capacity regulation, a low speed, large diameter piston which gives maximum volumetric efficiency, and a common cast iron base plate for both Pump and motor.

Consisting of 8 pages in two colors the bulletin describes the Pump in detail with photographs, drawings, capacity tables and text. Also included are a complete set of sample specifications and preferred arrangement drawings for the Pump when located at different elevations with respect to the Clarifier.

Water Pumping Costs

130

Edward E. Johnson, Inc., Saint Paul, Minn., has available a bulletin on the **Cost of Pumping Water.**

The bulletin, consisting of 3 full-page charts, shows how to: Determine the Power Cost of Pumping Water per Thousand Gallons; Determine the Overhead Cost of Pumping Water per Thousand Gallons; and Measure the Discharge of Pumps with Circular Orifice Weir.

A sketch showing how to construct a Circular Orifice Weir is also included on the back page of the bulletin.

Electric Contact Controllers

131

Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Philadelphia, Pa., has just published a catalog on **Vane Type Electric Contact Controllers.**

The 16-page Catalog illustrates and describes vane type electric contact control units used with Brown Instruments' Electr-O-Vane thermometers and pressure gauges, and with the ElectroniK potentiometer, as well as those employed in the new Pyr-O-Vane and Protect-O-Vane millivoltmeters, to give snap-action on-off, two position or three position control.

Vibrating Screens

132

Productive Equipment Corporation, Chicago, Ill., has published a bulletin on **Selectro Vibrating Screens** for industrial waste disposal.

The two-color, 4-page bulletin states that Selectro screens have a high capacity, give drier waste solids, and can screen finer for solids removal. This is due to their patented features of adjustable eccentricity and of inclination of the screen surfaces.

Page three shows by means of drawing and text suggested installations for waste disposal for both elevated and pit multiple units. The engineering features of the screens are described in detail and blown-up drawings of the salient features complete the bulletin.

Miniature Strip Chart Recorders

133

Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Philadelphia, Pa., has just published a Specification Sheet on **Tel-O-Set and Miniature Strip Chart Recorders.**

The Specification Sheet states that these instruments are specifically designed for graphic panel use, but can be employed wherever miniature recorders are desirable. Illustrations of the recorders and a description of their operation are included along with dimension and application drawings.

TE Explosion-Proof Motors

134

U.S. Electrical Motors, Inc., Los Angeles, Calif., has just published an 8-page bulletin on **Safe Totally-Enclosed and Explosion-Proof Motors.**

The bulletin discusses totally-enclosed motors both with and without fans, explosion-proof motors for hazardous service, and non-explosion-proof motors for non-hazardous services.

The center spread of the bulletin shows a cut-away drawing of the motors in full color. Features such as, Lubriflush bearings, split hub fan,

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normalized castings, hi-draft ventilation, removable cover, asbestos-protected windings and solid, centricast rotor are shown in separate full-color drawings along with explanatory text. Photographs of actual installations of the motors are shown on the back page of the bulletin.

Double Pitch Roller Chains

135

Chain Belt Company, Milwaukee, Wis., has just published a 12-page, 2-color bulletin that pictures and describes **Baldwin-Rex Double Pitch Roller Chains.**

The bulletin describes how these chains can often affect both cost and weight reductions in drives and conveyors. Charts, photos, diagrams, and tables show in detail all Baldwin-Rex Double Pitch Roller Chains—both drive and conveyor types—and the standard attachments available. There is also a description of double pitch chain sprockets.

Waterworks Gate Valves

136

Kennedy Valve Mfg. Co., Elmira, New York, has just published a new bulletin describing and illustrating the complete Kennedy line of **Iron-Body Gate Valves** for Municipal Water Supply Systems.

The bulletin covers AWWA specifications, operating mechanism, methods of operation, special features and end connections available—plus full dimensional data for sizes from 3 to 48 inches.

Calgon, The Versatile Material

137

Calgon, Inc., Pittsburgh, Pa., has published a series of four pamphlets on Calgon for use in water supply systems.

Calgon Controls Corrosion is the title of the first booklet, and it discusses how Calgon works and shows how it can be used to combat General Attack and "Red Water," Tuberculation and Pitting, and Corrosion at Elevated Temperatures.

Pamphlet two, titled **Calgon Restores Capacity of Wells** shows how Calgon Treatment for well cleaning works and give the complete recommended cleaning procedure along with a line drawing of an arrangement for feeding Calgon in well-cleaning.

Calgon Prevents Lime Scale, pamphlet number 3, gives typical results after application of the Threshold Treatment to the trouble and lists 17 different typical applications where Calgon is used for the prevention of scale deposition.

How **Calgon Stabilizes Dissolved Iron and Manganese** is the subject for the fourth pamphlet. The method of treatment, amount of Calgon required, and some typical field experiences are discussed. A line drawing showing a suggested installation is included along with a photo showing effect of varying amounts of Calgon used to prevent staining of clothes from water containing iron.

Motor-Driven Controlled Volume Pumps

138

Milton Roy Co., Philadelphia, Pa., has just published a new 24-page, 2-color bulletin on **Milton Roy Motor-Driven Controlled Volume Pumps.**

The bulletin will be of interest to anyone faced with the need of pumping practically any liquid, from heavy viscous liquids to light solvents, solids in suspension, abrasive slurries, hot or cold liquids, liquefied gases, and other materials.

The standard line of pumps as well as models designed for special applications are illustrated and described in the bulletin. Also included are details on how pump capacity can be regulated by plunger speed and plunger stroke adjustments. Capacity pressure selection tables form a part of this bulletin, too, to help users select the right pump for their particular application.

Lubricated Plug Valves

139

American Car and Foundry Company, New York, N. Y., has just published a bulletin on **Lubricated Plug Valves with Full Pipe Area** wedgeless cylindrical plug.

The bulletin states that the reasons why the cylindrical plug provides a tighter seal are: 1) lubricant not required to lift plug, 2) safety telltale to prevent rupture, 3) no exposed seating surfaces, 4) least number of parts, and 5) it turns easily.

Order number, sizes, ends, operation, working pressures and test pressures are given for all types of A.C.F. full area straightway semi-steel valves, A.C.F. round port full area semi-steel valves, A.C.F. straightway semi-steel valves (reduced area), A.C.F. multi-port full area semi-steel valves, and A.C.F. venturi type lubricated semi-steel valves.

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Photographs of the valves along with complete ordering information completes the bulletin.

CirclSeal Clamps

140

R. H. Baker & Co., Inc., Huntington Park, Calif., has published a 4-page, 2-color bulletin on **Baker CirclSeal Clamps.**

The bulletin states that the clamps are designed for Transite and Century pipe classes 50 to 200, Cast Iron pipe classes A to H, 100 to 250, Standard and O.D. Steel pipe.

Complete details on the construction of the clamps and their use along with photographs of the CirclSeal Clamps, HiPressure Clamps and HiPressure Clamp Lugs are given. Charts showing sizes and prices of the clamps and lugs complete the bulletin.

Pneumatic Sewage Ejectors

141

Ralph B. Carter Co., Hackensack, New Jersey, has available a bulletin on **Eject-O-Matic, Model BE Sewage Ejectors.**

The Bulletin describes the ejectors as being designed for the continuous, trouble-free, economical handling of sewage lift problems and contains a photograph of the unit. Specific advantages claimed are 1) simplicity, 2) no moving parts, 3) ability to pass solids up to size of inlet and discharge valves, and, 4) 100% reliability in handling small sewage flows with negligible attendance and maintenance requirements.

A chart giving capacity G.P.M., Head, Unit Number, Motor size and Speed is included in the bulletin to aid in the selection of the proper equipment. A dimension chart and complete specifications complete the bulletin.

pH & Conductivity Recorders & Controllers

142

Minneapolis-Honeywell Regulator Co., Brown Instruments Division, Philadelphia, Pa., has just published a new 40-page catalog covering **pH and Conductivity Recorders and Controllers.**

The catalog discusses pH (hydrogen ion concentration), oxidation-reduction potential, and electrolytic conductivity. Up-to-date information on equipment of these vital process variables is also discussed.

Extensive revisions of a previous catalog were made and incorporated into the new catalog along with new information on latest designs of pH electrodes and conductivity cells. Included are fundamental operating principles, descriptions of measuring systems, and details of components, as well as numerous typical applications.

Municipal Supplies

143

W. S. Darley & Co., Chicago, Ill., has available a complete catalog covering all of the **Municipal Supplies** handled by them.

Containing more than 250 items of interest to municipalities, of which over 100 items are used by water and sewage plants. Everything from pipe and line locators to sewer cleaners and scrapers are shown by means of photographs and drawings. Accompanying text includes complete description and prices.

Other municipal supplies shown include traffic signals, police equipment, street equipment and fire equipment.

Sewer Cleaners

144

Champion Corporation, Hammond, Ind., has made available a 28-page catalog on **OK Champion Sewer Cleaners.**

The catalog covers the complete line of both power and manually operated cleaning machines. The features and construction details of each model are thoroughly explained and photographs and drawings illustrate these features. Expansion sewer buckets, root cutters, manhole jacks, special sewer cleaning cable and accessories are also shown and discussed in detail.

Ordering information and complete price lists complete the catalog.

Filter Bottom Blocks

145

Bowerston Shale Co., Bowerston, Ohio, has published a bulletin on **Bosco Drainage Materials and Face Brick.**

The bulletin discusses technical features and flow capacity of the Bosco filter bottom blocks and line drawings show the blocks, with all angles available, and reducer blocks. Other drawings show: typical arrangement of blocks in trickling filter; cover blocks over effluent channel; cover blocks around distributor pier; and vent pipe covers.

Also shown and discussed are the Bosco perforated plain end pipe and the Bosco Tru-Line spring clip connector for pipes used in drainage work.

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INDEX TO ADVERTISERS

A

Ace Pipe Cleaning Contractors, Inc. 24A
*Activated Alum Corp. 80A
Amercoat Corp. 31A
*Anthracite Equipment Co. 109A

B

Buffalo Meter Co. 15A
*Builders-Providence, Inc. 97A
Bulkley, Dunton Pulp Co., Inc. 78A
Byers Company, A. M. 7A

C

Carlon Products Corp. 81A
Carson, H. Y. 106A
Cast Iron Pipe Research Ass'n 10-11A
Cement Gun Co. 103A
Chain Belt Company 6A
*Chicago Bridge & Iron Co. 13A
*Chicago Pump Co. 77A
Climax Engine & Pump Mfg. Co. 87A
Clow & Sons, J. B. 81A
Continental Steel Co. 103A

D

Dixie Tank & Bridge Co. 88A
Dow Chemical Co. 93A
Dresser Manufacturing Div. 18A

E

Eveready Supply Co. 106A

F

Filter & Stowell Co., The 96A
Flexible Sewer Rod Equipment Co. 86A

G

Greenlee Tool Co. 100A
Gruendler Crusher & Pulverizer Co. 106A

H

Hamilton-Kent Mfg. Co. 4A
Healy-Ruff Co. 107A
Hersey Mfg. Co. 17A
Hilts-McCanna Co. 85A
Hotel Tuller 104A
Hydraulic Development Co. 108A

I

*Industrial Chemical Sales Co. 21A
*Infilco Inc. 27-28A

J

*Jaeger Machine Co. 19A
*Jeffrey Mfg. Co. Third Cover
Johnson Gear & Mfg. Co. 100A

K

Keasbey & Mattison Co. 12A
Kennedy Valve Mfg. Co. 89A

L

Layne & Bowler, Inc. 26A
Leadite Co., The 106A
Leopold Co., F. B., Inc. 105A
*Link-Belt Company 14A
Lock Joint Pipe Company Second Cover

Mc

McWane Cast Iron Company 84A

M

*M. & H. Valve & Fitting Co. 98A
Minn. Honeywell Regulator Co. Brown Instruments) 79A
Morse Bros. Machy. Co. 94A
Mueller Company 30A

N

Neptune Meter Co. 32A
Northern Gravel Company 107A
Northrop & Co., Inc. 109A

O

*Omega Machine Co. 22A

P

Pacific Flush-Tank Co. 25A
Payne Dean & Co. 108A
Phipps & Bird, Inc. 103A
*Pittsburgh-Des Moines Steel Co. 23A
Portland Cement Assn. 20A
*Proportioneers, Inc. 101A

R

Roberts Filter Mfg. Co. 105A
Rockwell Mfg. Co. 3A
Roots-Connersville Blower Corp. 91A

S

Saran Lined Pipe Co. 93A
Smith Mfg. Co., A. P. 99A
Smith-Blair, Inc. 95A
Speelmon Elevated Tank Service 109A

T

Tennessee Corporation 80A

U

*U. S. Pipe & Fdry. Co. 29A
U. S. Stoneware Co. 9A

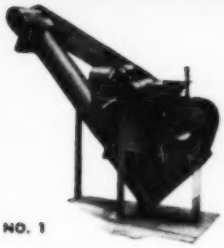
W

Wachs Co., E. H. 98A
Walker Process Equipment, Inc. 92A
*Wallace & Tiernan Co., Inc. Back Cover
Warren Foundry & Pipe Corp. 82A
Wilkinson Products Co. 104A
Wood & Co., R. D. 16A

*Advertisers with * were represented in the April, 1951 Convention and Data Edition with Catalog specifications copy. Please refer to that issue for additional information on behalf of their products.

GRIT WASHING WITH THE JEFFREY

(Reg. U. S. Pat. Off.)

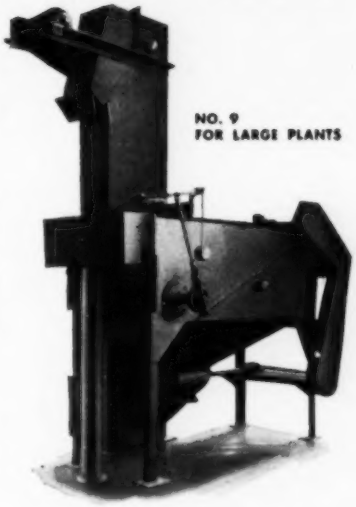


NO. 1

Scrubbing grit, freeing adhering organic solids and rejecting them with the overflow, classifying the products . . all these can be done efficiently with Jeffrey JIGRIT Washers (Patented), a type and size to meet your need exactly.

It has been shown by field studies that grit should be collected by one mechanism and washed in a separate unit. Jeffrey builds both . . collectors of the chain and scraper or chain and bucket type, or a combination of the two . . a series of Grit Washers as shown on this page.

Typical arrangements are available in drawing . . let us help you select the best means for collecting and removing grit from the channels.



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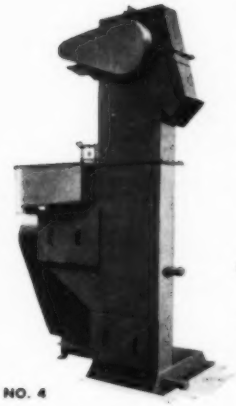
FOR LARGE PLANTS



NO. 4

Other Jeffrey Equipment for Sewage, Water and Industrial Waste Treatment:

Bar and Disc Type Screens
Screenings Grinders
Sludge Collectors
Grit Collectors and Washers
Sludge Elevators
Chains and Sprockets
Chemical Feeders
FLOCTROLS
Garbage Grinders
Scum Removers
Conveyors

Send for Catalog No. 833

	❶	❹	❾
Capacity	20 cu.ft. per hour	120 cu. ft.	280 cu.ft.
Removes	80% Organics	90%	90%
Recovers	90% Inorganic grit	90%	90%
Feed Water	15 Gal. per min.	45-70 g.p.m.	100-140 g.p.m.

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Complete Line of Material Handling, Processing and Mining Equipment

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When you look at a single W&T Chlorinator you can't *see* the basic research, the complete line of equipment, and the service that are behind it.

For instance, the engineer, the plant operator and the taxpayer all benefit from W&T's complete line of equipment. In the selection of equipment for a water supply — large or small — the engineer can always find a W&T Chlorinator to fit the requirements. The plant operator knows that this complete line can provide a W&T Chlorinator designed to help him provide safe water with his particular plant layout. The taxpayer is assured that money spent for W&T Equipment fitted to the present as well as the future needs of his community will provide long range economy.

These advantages of W&T's wide selection of equipment are probably one reason so many people use W&T Chlorinators.

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